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INDIAN FORESTER.

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FOREST ORGANIZATION FOR BEGINNERS.

(*Continued from page* 529).

SECTION II. DIFFERENTIATION.

CHAPTER III.—FORMATION OF COMPARTMENTS, SUB-COMPARTMENTS AND RANGES.

WHEN a map showing the boundaries and principal features of the land has been made, the forest should be divided into a number of compartments by means of a system of rides, or by natural divisions, or both.

It is evident that to estimate the quantity of standing-stock on a large area, would be very difficult if the forest consisted of groups of different ages, density, or species : small portions (compartments) must, therefore, be dealt with separately, and demarcated by means of rides, &c., so as to be easily distinguished on the ground and on the map. Another reason for this procedure is that, without lines of separation, it would be extremely difficult to fix the position of each group. Rides are also very useful as a protection from fire, because if the grass on them be burnt just before the hot weather, a fire breaking out in the forest on one side of the ride might be arrested by it, and the forest on the other side saved. Again, trees which have grown up in thick cover cannot, after a certain age, be exposed to sun and wind with impunity ; they are apt to lose their bark, to get what is called sunstroke, and to be uprooted by wind ; but the formation of rides enables trees on their edge to grow up vigorously, to throw out numerous branches and roots, and to get a firm hold of the soil, which trees growing in dense cover cannot have ; it accustoms them, in short to the exposed situation, so that, even if the groups in the compartment in front be cut away, they are able to withstand and break the force of the wind, thereby protecting the more weakly trees behind, which could not otherwise resist the storm. Another

advantage of having rides is that a coupe* may be located almost anywhere, whereas, if there were no rides it might, and generally would be necessary in seedling-forests,† to commence cutting at one end, and to work steadily through from the fair-weather quarter to the stormy quarter of the compass, in order that the forest in front should protect the portions suddenly exposed by the cutting, and those in process of regeneration; and if immature groups were met with, they would have to be sacrificed in their turn in order to ensure a proper sequence of coupes. Finally, rides are often very useful as export-roads: as open places for stacking and drying the material collected for sale: and in facilitating the inspection, regeneration and cutting of groups.

To recapitulate—the object of forming compartments and separating them by means of rides is briefly this:—to facilitate the survey of interior details and the estimate of standing-stock: to ensure the carrying-out of a regular system of cuttings and regeneration, which would be impossible in forests not so parcelled out, to avoid the evil effects of suddenly exposing trees, which have grown up in thick cover, to wind and sun: to afford protection from fire: to admit of freedom in locating coupes: to facilitate the regeneration of groups and the extraction of the produce: and to afford suitable places for collecting and drying it.

Rides are of two kinds—*main* and *minor*. The former, as already explained, must be made broad enough to admit of the trees on their edges throwing out vigorous roots and lower branches, and thus forming a protective fringe against wind. Minor rides may be made much narrower, their primary object being the division of the forest between two main-rides into compartments of convenient size. Sometimes, however, they are used as fire-traces, and have to be made as broad as main-rides.

The width of main-rides depends on the station, kinds of tree, and régime. In high-lying, exposed localities, subject to violent storms, their width has to be made greater than is necessary in sheltered parts of the country. Again, seedling-forests subject to long revolutions require broader rides than those subject to shorter revolutions, or than coppice, in which there is generally nothing to fear from wind; and trees whose roots do not penetrate far into the soil require greater protection than trees which are more deeply rooted. 15 to 60 feet may be taken as limits, and it may be assumed in a general way that

* A *coupe* is a term used to denote any area on which a cutting is carried out.

† The term *seedling-forest* is applied to any group which has originated from seed, in contradistinction to the term *coppice*, which is applied to groups originating from the shoots of tree-stumps, or from suckers. The term *high forest* is very often used instead of *seedling-forest*, but that is quite a misnomer, as the forest may be cut down long before it attains to any considerable height, and in its earlier stages it is necessarily low.

a breadth of 15 feet will suffice for coppice, and of 45 feet for seedling-forest. When intended to serve as a protection from fire, rides should seldom be made less than 60 feet broad, and will often have to be made much broader: the breadth will then depend mainly on the kind and density of the jungle; if the cover is good, there will be little or no grass, and 45 feet may suffice, but in open jungle with long grass a breadth of at least 60 feet is necessary.

Minor rides need not exceed 8 feet in breadth, provided they are not required for cart-traffic, nor fire-traces.

In flat, or gently undulating country, the best plan is to have a regular network, the main-rides running parallel to each other, and in the direction usually taken by heavy storms, and the minor rides joining them at right angles. The distance apart of the former should not be too great to admit of a cutting being made along the whole length of the minor ride connecting two main-rides. The forest will then be divided into a number of parallelograms, or other figures (compartments), whose size will depend on the station,* topographical features, such as roads and streams, which may be conveniently used in place of rides, and on the kind and age of the trees inclosed. It is well to separate lands differing considerably in productiveness, and groups differing greatly in age, at the same time not forgetting that very large compartments are inconvenient, and that very small ones necessitate a great deal of land, taken from the productive area, being turned into unproductive rides. Experience teaches that compartments of 25 to 75, or at most 100, acres are the most convenient for administrative purposes, but for the sake of economy it may often be found necessary to exceed considerably that maximum. In determining their position and extent, it is well to bear in mind that it is important to separate portions of forest which are likely to differ permanently, so that differences of station should be the chief consideration; differences that may be more of a temporary nature, such as differences of species, age, or density, are of much less importance, because in course of time it will generally be possible, if necessary, to bring about uniformity in these respects if the station itself is tolerably uniform. The sides of a compartment which are bounded by main rides should, if possible, be about twice as long as those adjoining its minor rides, as it is found that the most convenient shape for administrative purposes is thus obtained.

The object of having the broad rides running in the direction generally taken by heavy storms, is of course to afford protection to the cuttings and young growth by means of the forest in front. In mountainous country it is desirable

* The term *station* is used to denote the three factors on which the growth of a group naturally depends, *viz.*, soil, climate and situation.

that they should follow the configuration of the ground, *i.e.*, that they should be as nearly horizontal as is convenient, so that they may be useful for the transport of produce. Roads, when not too sinuous, make the best boundaries of compartments, and the system of export roads should, therefore, be determined on before the compartments are marked out. Natural boundaries, such as streams, valleys, ridges, afford natural divides, and should be utilised in laying out lines of separation for compartments and blocks.

The portion of forest lying between any two main-rides (or their substitutes) is called a *block*.

The whole system of rides should be pegged out on the ground, and marked on the map in pencil before any are opened out; or it may be necessary to cut very narrow lanes in the forest; any alterations can then be easily made if it is discovered as the work progresses that changes are necessary: such narrow passages are of no consequence when they have to be abandoned, but of course the case would be very different if rides were opened out to their full width and afterwards abandoned.

The accompanying sketch (*Fig.* 1) represents a hill forest with main rides following the configuration of the ground, which is shown by means of contour-lines. The stormy quarter is on the left, and the cuttings of groups in a compartment march in the main from east to west, in the direction indicated by the arrows.

Minor rides are often practically main rides. Those in the sketch, for example, which separate compartment 10 from compartment 11, and 9 from 12, ought to be as wide as the main rides if the flanks of the compartments are to be properly protected.

As a rule, as soon as the position of rides has been definitively settled, they should be opened out to their full extent, and all stumps and roots eradicated. Sometimes, however, it is dangerous to open out new rides running through seedling forest, to their full width. This may be the case when a ride is taken through a densely stocked group which has got beyond the thicket stage and attained to a fair height. The trees will then be lanky and weak, and, if a broad ride were suddenly cut through them, a storm might get into the group and cause great havoc by uprooting and breaking a number of trees. In such cases it is advisable to open out the line gradually, or it may be opened to the breadth of a few feet only, and so left until the forest is regenerated, when the ride can be enlarged without danger.

Very large areas have to be split up into smaller units, called *ranges*, each one being in charge of a ranger, or manager, and distinctly marked off from the others by natural or artificial boundaries. Their size depends upon the extent of forest which can be efficiently managed by one official. No general rules

can, however, be laid down. Special circumstances, such as the kind and quantity of work to be done and the situation and value of the forest, must decide the matter. A forest, for instance, producing a large crop of minor produce, as well as timber and firewood, would generally require smaller ranges than one yielding only firewood. Generally speaking, forests worked intensively, that is, those in which a comparatively large capital is locked up, require smaller ranges than those which require a comparatively small outlay for their maintenance. Take, for instance, the case of a range yielding timber, firewood and valuable minor produce, and that of one simply producing firewood-coppice. Area for area, there would be a much larger capital required for working the timber-forests, in which there would be a valuable standing-stock and crop of minor produce, an establishment for guarding the latter, and for collecting, drying, and storing it, in addition to a large protective establishment for the forest generally. In the case of the range yielding only firewood, the standing-stock would be of little value, comparatively speaking; the expenditure for guards would be small, and there would be no outlay at all on account of minor produce. Evidently, a ranger could manage a much larger extent of the coppice than of the other forest with its numerous staff and accounts.

To enable foresters and workmen to find the compartments easily, roughly cut, small, numbered stones standing out 15 inches above ground, or, where stone is not available, wooden posts, should be erected at points where rides meet, and also at intermediate points in rides which are very long. The distance between these stones should not, as a rule, exceed two hundred yards. Where the expense of putting up stones or posts is too great, or where there is fear of posts being burnt by ground-fires, it will often be found possible to throw up mounds of earth or stones, or to have the more durable kinds of mark at the corners, and the less durable at intermediate points. They should be erected on the sides of rides, not in the centre, where they are more liable to be damaged and may interfere with traffic, and all should be on the same side of the rides, either on the right or left, so that they may be easily found. The numbers should be cut on the stone, and may be painted over to make them more easily distinguished.

All ride-stones and their numbers, as well as those of compartments, should be shown on the working-map, but may be omitted on inspection-maps, which are too small for such details.

When the organiser finds that the forest has already been split up into blocks, he should accept, as far as possible, existing sub-divisions, only making such additions and alterations as appear to him absolutely necessary.

Groups in the same compartment have to be separated from one another by some inexpensive means, such as wooden posts,

small mounds of earth or stones, or by narrow cleared lines. Such boundaries are shown on the detail-map by means of dotted lines, and the area occupied by each group is called a *sub-compartment.* Each sub-compartment is known by a letter of the alphabet with the number of the compartment prefixed: thus, 5 *a* is sub-compartment *a* of compartment 5 (*see Fig.* 2). Groups occupying an area of less than an acre need not be separated.

SECTION III. ASSESSMENT.

The organizer is now in possession of a forest which has been divided into compartments and sub-compartments, and he may, therefore, proceed to the assessment of groups, that is to say, to a description of their station, and an estimate of their age, height, quantity, value and rate of growth; but before entering into this part of the subject, it will be necessary to devote a chapter to a description of the instruments which are mostly employed in the assessment of groups.

CHAPTER IV.—INSTRUMENTS REQUIRED.

Besides the ordinary surveying tools, instruments are required for measuring the diameters or circumferences of trees, and their heights, and for estimating the cubic contents of wood of irregular form, which cannot be directly measured.

DIAMETER AND CIRCUMFERENCE MEASURES.

One of the best forms of diameter-measure is the one shown in the accompanying diagram (*Fig.* 3). The arms AB, CD, are made of well-seasoned teak or oak. The limb EF is fixed at right angles to AB at E, and slides through an aperture in CD. The limb GH is fixed at right angles to CD, and fixed to CD at G, sliding through an aperture in AB. GH is made to run along a V-shaped rail on EF to prevent the limbs from separating when one is drawn out beyond the aperture in CD or AB. The limb EF is divided from the point E into inches and fractions of an inch, the divisions being numbered from E to F, and continued along the lower limb from G to H; thus, if from E to F is 24 inches, the first inch on GH would be marked at the end near G, and be numbered 25. In using the instrument, it is grasped by the handles at B and D, and its arms are placed so that the trunk to be measured shall be between them. B and D are then pressed towards each other until both arms are resting against the tree; the diameter is then read off on the limb EF, or GH, as the case may be. This is a very handy and portable instrument. Its dimensions depend on the size of the trees to be measured. With arms and limbs 3 feet long, trees up to 5 feet in diameter may be conveniently measured.

For measuring circumferences an ordinary tape, or one of steel or leather, is used.

Trees can be measured much more expeditiously with the diameter-measure than with the tape; the latter may, perhaps be slightly more accurate for *single* trees, but even that is doubtful, and, anyhow, whatever slight advantage is gained in this respect, is more than counterbalanced by the comparative slowness of the process. When many trees have to be measured, the advantage of greater accuracy probably lies in favour of employing the diameter-measure. When the bole is very elliptical, it may be measured in the directions of the major and minor axes, and the mean of the two readings taken. Some foresters recommend that masses of forest should be measured with the diameter-measure, but single trees, such as sample-trees, with the tape; others, on the other hand, think the tape should be discarded altogether.

In measuring trees, allowance must be made for the thickness of the bark. This must be estimated for each diameter-class, and deducted after all measurements have been made in the field.

Height-Measures.

Many methods of estimating the quantity of standing-stock involve the use of instruments for measuring the height of standing trees. A theodolite is an excellent instrument for this purpose, but is troublesome to carry about, and its use takes up too much time to admit of its being generally adopted. The process of finding the height of trees with one is simple. Let CD, *Fig.* 4, be a tree whose height is to be measured. Set up the theodolite anywhere, at A, if possible, at a distance from the tree equal to about the height of the tree. Measure the angles BAC, BAD, and the horizontal distance (a) from A to the foot of the tree, D, along the ground, *making allowance for its not being horizontal, if necessary.* (a) will be equal to AB, and the height, H, of the tree will be found by the formula

$$H = (\tan BAC + \tan BAD)\ AB,$$

or since the measured length, $a = AB$,

$$H = (\tan BAC + \tan BAD)\ a.$$

If the theodolite is below the foot of the tree

$$H = (\tan BAC - \tan BAD)\ a. \quad (Fig.\ 5).$$

If the theodolite and the foot of the tree are in the same horizontal plane, the angle BAD disappears, and the formula becomes

$$H = \tan BAC \times a.$$

The reflecting hypsometer, invented by a German forester, is a more generally-useful and a thoroughly-practical instrument. It consists of a rectangular board, ABCD, some 9 inches by 5

in size, whose lower edge, CD, is divided into 150 equal parts to the left of the centre of the slide, *k*, and 50 to the right of that point, as shown in *Fig.* 6. The slide is moveable up and down a groove in the board at right angles to CD, and kept in any required position by a spring placed in the groove behind it. The eye-piece, *n*, and the objective, *m* (consisting of a horse-hair wire), are fixed to the board, so that a straight line connecting them would be parallel to AB and CD. CEFH is a mirror, by means of which readings can be taken at the same time as observations. The pieces *m* and *n*, consisting of brass, and the mirror, which has a backing of tin or brass, turn on hinges, and can be laid back flat on the board, so as to pack up easily into a small case. On either side of the groove the distances from CD, on the same scale as the horizontal scale, are shown. The plumb-line, *p*, is fixed in the centre, and near one end of the slide. By raising or depressing the latter, which is fifty divisions of the scale in length, the distance of the point of suspension of the line from DC can be increased from 60 to 120, whilst by inverting the slide, so that the end marked I is above, and that marked II below, the distance can be reduced to 10.

To use the instrument, measure the *horizontal* distance, in feet or yards, of the observer from the tree. Set the slide at the same relative distance on the vertical scale ; then, looking though the eye-piece, align the top of the tree with the hair at *m*, allowing the plumb-line full play. As soon as the latter is at rest, the number which it intersects on the horizontal scale can be read off in the mirror, and indicates the height of the tree, in feet or yards, as the case may be, if the observer's eye is on the same level as the foot of the tree; otherwise, a further observation will have to be taken to the foot of the tree, the result being added or deducted from that already obtained, according as the eye of the observer is above or below the foot of the tree.

The rationale of this method is as follows :—In *Fig.* 7, let BD represent the tree, and A the hypsometer, on which *ac* represents the vertical, or, as it is called, distance-scale, and *bc* the horizontal, or so-called height-scale. Draw a horizontal line, AC, from the eye-piece, A, meeting the tree in a point, C. Then, since the tree grows vertically, ACB is a right angle ; *acb* is also a right angle, and the two angles are therefore equal. BC is parallel to *sb*, therefore A*sb* = ABC ; and A*s* being parallel to *bc*, *sbc* is also equal to A*sb*; therefore *sbc* = ABC, and the triangles ABC and *abc* are similar ; and

$$BC : AC = bc : ac$$

but by construction AC is represented by *ac*, therefore BC is represented by *bc*.

In *Fig.* 8, it is also evident that the triangle ACD is similar to the triangle *acd*, and that, therefore,

$$CD : AC = cd : ac,$$

and that AC being represented by *ac* by construction, CD is represented by *cd;* but the whole length of the tree is equal to BC + CD, therefore it is represented by *bc* + *cd*.

When the observer's eye is below the foot of the tree, as in *Figs.* 9 and 10, it is evident that the height of the tree will be found by deducting CD from BC. The values of CD and BC may be found in the manner just described, the observation for BC being taken to the top of the tree, whilst that for DC is taken to its foot.

Apparatus for determining the Cubic Contents of Amorphous wood.

Firewood is generally, and small timber sometimes, sold in stacks or loads, the size of which may vary in different parts of a country, and the solid contents of which is sure to be different for different parts of a tree. A stack of stem-wood contains, for instance, more solid matter than a stack of the same dimensions containing branches of the same tree. Wood of very irregular shape or very small size cannot be directly measured; hence the necessity of finding out the solid contents of a standard stack for different descriptions of wood (stem, large branches, and spray, for instance), and for different species separately. The process of measuring the contents of amorphous wood is tedious, and it would be impossible to measure every stack. The average of a number of experiments is, therefore, generally taken as a standard for a species, and for a whole district or country. Thus, in the Grand Duchy of Hessen, the average percentage of solid wood for all species is fixed as follows :—

Description.	Solid contents of stack, cubic feet.	Dimensions of stack.	Remarks.
Split stem-wood over 5 inches in diameter,	70 per cent. of size of stack,	4 by 6 by 12 feet.	Wood sawn in 4 feet lengths and worked up at right angles to length of stack.
Unsplit, smooth, or straight, stem or branch wood, 2 to 5 inches in diameter,	60 per cent.	Do.	Do.
Split stumps, ..	50 per cent.	Do.	
Small spray, ..	25½ per cent.	..	Branches 12 feet long and stacked in the direction of the length of the stack.

The result depends greatly on the way in which the wood is stacked, and on the dimensions of the pieces. Uniformity in these respects must, therefore, be strictly observed. Stacks of crooked, knotty wood, although of the same size as smooth, straight wood, should be estimated separately.

The solid contents of amorphous wood may be determined by means of the apparatus shown in the accompanying figure (*Fig.* 11). A cylindrical vessel, A, about 4 feet high and 2 feet in diameter, communicates with a similar vessel, B, by means of a tube at C. A glass tube, *t*, communicates at the bottom of the vessel B with its interior, the water in which can be let off by means of the stop-cock, *k*. By means of a graduated metallic scale and the glass tube, the cubic contents of water in B can be read off. To graduate the scale, a vessel of exactly one cubic foot capacity is filled with water which is poured into B, which is placed in a vertical position. The water rises to the same height in the tube as it is in the vessel, and the height to which it rises indicates the distance on the scale corresponding to a cubic foot of water in the vessel. This distance is then divided into fifths or tenths, each one of which will correspond to the fifth or tenth part of a cubic foot of water. In this way the scale is graduated up to the top. By reducing the diameter of B to one foot, greater accuracy will be attained, and the vessel need not be made any higher. The vessels A and B may be made of wood, but block-tin or zinc is preferable for the latter.

To use the apparatus, place A and B in a horizontal position, fill the vessel A with water up to the spout *c*, and place the mouth of the tube so that water passing through it will run into the vessel B. Then completely submerge the wood to be measured in the vessel A. This may be most effectually done by means of a finely perforated zinc or block-tin lid, exactly fitting the interior of A. The consequence will be that the submerged wood will displace a quantity of water equal to its bulk, which will overflow and run into the vessel B, when its cubic contents can be read off on the scale. The operation should be quickly performed, as wood soon absorbs moisture if left standing in the water.

The following is a less troublesome method, if not quite as accurate as the preceding. The cubic contents and weight of an easily measured portion of a tree of the required species is accurately determined, and the weight of one cubic foot deduced from the result. The weight of a standard stack of amorphous wood is then ascertained, and its cubic contents deduced from the known weight of a cubic foot of the measured wood. The proportion that the solid contents bear to the dimensions of the stack can then easily be found. If, for example, we find that part of the bole of a freshly cut blackwood-tree, measuring 3·005 cubic feet, weighs 200 lbs., that freshly cut spray of the same species, which, when stacked, occupied a space $5' \times 5' \times 4' = 100$ cubic

feet, weighs 2,000 lbs., we would then have one cubic foot weighing $200 \div 3{\cdot}005 = 66{\cdot}639$ lbs., consequently, 2,000 would be equivalent to $2{,}000 \div 66{\cdot}639 = 30$ cubic feet; but, by hypothesis, these 30 cubic feet of spray actually occupy, when stacked, a space of 100 cubic feet; therefore, a stack of such wood, under similar conditions, might be assumed to contain only $\frac{100}{30}$ of its space, or about 33 per cent.

(*To be continued.*)

THE INDIAN FOREST SURVEY AND FOREST SCHOOL.*

It is only in comparatively recent times that measures have been undertaken to preserve what remained of the great Indian forests. The first thing to do was to demarcate the tracts which were to be reserved, and to free them as far as possible from rights. The area now reserved is about 48,000 square miles, or about $5\frac{1}{2}$ per cent. of the total area of British India, not including the Native States. The tracts demarcated owe their immunity from destruction either to the fact that they occupy ground which was, in the absence of communications, inaccessible, or which is much broken, or cannot be irrigated. They are situated either in the plains or on the low ranges of hills rising from them, or on the lower or middle slopes of the Himalayas up to an elevation of 8,000 or 9,000 feet above sea level. Although they include within their boundaries considerable areas which have been wholly or partially denuded of trees, the ground is generally speaking more or less densely covered with trees and jungle.

In former years accurate forest maps were not required, but the present system of management renders good maps indispensable, and in 1872 measures were taken to provide them. The Imperial Survey Department could not conveniently undertake the work, and it was consequently thought desirable to organise a special branch of the Forest Department to act under the control of the Surveyor General. This arrangement has worked most satisfactorily. The scale of the maps formed the subject of much discussion, but ultimately it was decided that the scale should usually be $4'' = 1$ mile for the most valuable forests, and $2'' = 1$ mile for those of less value. An establishment of Surveyors was then raised and trained. The first work undertaken was the survey of the forests of Dehra Dún, area about 573 square miles, the private lands of the district being surveyed at the same time by the Imperial Survey Department, and a

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* By Major F. Bailey, R.E., F.R.G.S., Superintendent of Forest Surveys in India.

Abstract of two papers read before the British Association at Aberdeen on 10th and 11th September, 1885.

combined map of the whole country being thus produced. The next work was the survey of the Kumaon and Garhwál forests, area about 1,400 square miles; and the survey of an area of about 1,600 square miles in Haiderabad is now in progress. Altogether since 1872 about 3,000 square miles have been surveyed and mapped, mostly on the scale of 4″ = 1 mile. It will of course take a long time to work over the whole of the forest property, but detailed maps of the entire area are not urgently needed at the present time, since for forests in which simple protection can alone be attempted small-scale maps or sketch-maps will suffice for some years to come.

When the survey party takes the field, the officer in charge has command of a considerable number of men, with a large quantity of stores and equipment. He has to hire carts or camels, and march to the scene of the work. On arrival, each Native Surveyor is given a piece of work, four or five of them being grouped under one European Surveyor, and a computing office is established in some central position. When sufficient work of this kind has been done, or when the season is too far advanced for it to be continued, the party moves back to head quarters. If such work is not well controlled it is sure to show this in inferior quality, insufficient quantity, or high cost. The procedure must be varied according to circumstances, and it has to be considered how a map that will answer the purpose can be produced in the shortest time and at the smallest cost. The ground worked over by the Forest Survey Department presents exceptional difficulties, of which the following are the principal: the surface is much broken up, the crop of trees and jungle is dense, the supply of drinking water is precarious and often of bad quality, the forests are infested with wild animals, food is difficult to obtain, and jungle fever is by no means uncommon. The wild animals are not at all appreciated by the unarmed Native Surveyors, and many cases have occurred in which they have caused the most serious inconvenience, stopping the survey of certain tracts for a long time. The experience gained of the Natives of India in the Forest Survey Department has shown that almost anything can be made of them. The principle adopted has been to stimulate them to exertion and to promote a spirit of emulation among them; they were taught that accuracy was of more importance than rapidity, and encouraged to bring to notice all discrepancies in their work. At first only the most simple operations were entrusted to Natives, but a few of them can now do excellent work of the most difficult kind. The combination of European and Native labour has answered very well. Detailed surveys of wild and densely wooded ground have rarely been made before in India, and it is evident that they must be more expensive than similar surveys of open, cultivated country; but to provide them is a necessity and a distinct economy.

THE INDIAN FOREST SCHOOL.

It is only within the last twenty-five years that a special State Department has administered the Indian forests. The staff was at first composed of men who had received no professional education, but they were able to do all that was then needed, and they accomplished work of great value. As a result of their work the State became possessed of large forest areas, from which a permanent supply of produce had to be secured, and which had therefore to be managed systematically. But at this time nothing was known of systematic forestry in England or in India, and an arrangement was made in 1866 under which candidates for the Indian Forest Service were trained on the Continent. The arrangement then made with the French Government is still in force, but it has now been decided to undertake the instruction in England. Great progress has been made in Indian forestry, and this is mainly due to the professionally-trained men with whom the Forest Department has been recruited; but up to 1869 nothing had been done towards the education of the subordinate ranks. As work requiring professional skill became necessary over large areas, it was found that the 'division' must be broken up into a number of smaller executive charges under Natives of the country, and that they must receive a professional education. In 1869 Mr. Brandis made proposals to organise the subordinate grades and to train men at the Civil Engineering Colleges, and several other attempts were made in the same direction, but without marked success.

In 1878 Mr. Brandis proposed to establish a Central Forest School, and his proposals were accepted by Government. The chief object of the school was to prepare Natives of India for the executive charge of forest ranges, and to qualify them for further promotion, but it was hoped that it might ultimately be used to train candidates for the controlling branch. The chief forest officers of provinces were to select candidates and send them to be trained at the school; none but Natives of India* being admitted. A number of forests near Dehra Dún were grouped together as a training ground and placed under a separate Conservator, who was also appointed Director of the school; a board of inspection was also appointed. The first theoretical course was held in 1881, and courses have been held every year since then.

The present system is that the candidates, who must be in robust health, are selected by Conservators of forests or by the Director of the school. They must serve in the forests for at least twelve months before entering the school. Candidates for the Ranger's certificate must have passed the entrance examination of an Indian University on the English side; candidates

* In the widest legal acceptation of the term.—[Ed.]

for the Forester's certificate must have passed a lower examination. The course of training for these two classes extends over eighteen and twelve months respectively. Men who gain the certificates return to their provinces, and are employed there. The course of instruction for the Ranger's class embraces vegetable physiology, the elements of physics and chemistry, mathematics, road-making and building, surveying, sylviculture, working plans, forest utilisation, forest botany, the elements of mineralogy and geology, forest law and the elements of forest etiology. The course for foresters is much more simple. The preparation of manuals is in progress, and a library, museum, chemical laboratory, observatory and forest garden have been established.

The period of probation in the forest before entry into the school has a twofold object: *firstly*, to enable the theoretical course to be understood; *secondly*, to eliminate men who are unsuited to a forest life before time and money have been spent on their training. As a rule, the students are *employés* of the Forest Department, and they draw their salaries and maintain themselves while at the school; no instruction fees being charged. It would not at present be possible to get candidates whose maintenance and education are entirely paid for by their friends. Nine men who have left the school hold appointments worth from £125 to £200 a year, and this ought to draw eligible candidates. Conservators of forests say that the men trained at the school are markedly superior to their untrained comrades. The area of reserved forests has largely increased of late, and the prospects of the students are very good. During the session of 1884 there were forty-six students of all classes at the school, of whom eight were from Madras and seven from Native States, the Chiefs of which have been induced by the establishment of the school to take measures for the protection of their forests. The school has now been made an imperial institution, and this is a great advantage in every way. The expenses of the school in 1884 are said to have been £1,911.

GROWTH OF SAL.

It would be interesting if Divisional officers would give results of their observations on growth of sál for comparison with the figures given below. It is now some years since the system of sample plots with careful yearly measurement of sál trees was instituted, and the data already obtained must be very valuable.

In Kumaon three plots of half an acre each were enclosed in 1881, and measurements have been taken annually for the last four years. These plots were in various parts of the Division, but as they are similar in every respect—except a slight varia-

tion in elevation—the results below given are for the whole area of 1½ acres.

The following is a brief description of the forests experimented on :—

Elevation.—From 1,000 feet to 2,000 feet.

Aspect.—A gentle slope to the south.

Soil.—A well drained sandy loam mixed with boulders and rock.

Standing crop.—125 sál and 16 miscellaneous trees to the acre. The sál trees are in the following proportion :—

II. Class.		III. Class.		IV. Class and under.
1	:	6	:	14

Undergrowth.—Light grass and a few bamboos.

The results of measurements during four years are as under—

Annual girth increase per tree in inches and tenths.

II. Class. 4½′ to 6′.	III. Class. 3′ to 4½′.	IV. Class and under. ½′ to 3′.
0·73	0·47	0·28

In 1884, three other plots of two acres each were prepared in close proximity to the half acre plots, the forest being thus precisely similar. These two acre plots were heavily thinned by the extraction of 68 sál and 16 miscellaneous trees per acre, leaving thus 57 sál trees standing on each acre.

The remaining sál trees were in the following proportion :—

II. Class.		III. Class.		IV. Class and under.
1	:	4	:	3

The measurements taken in 1885 of these two acre plots give the following results :—

Annual girth increase per tree in inches and tenths.

II. Class. 4½′ to 6′.	III. Class. 3′ to 4½′.	IV. Class and under. ½′ to 3′.
0·75	0·76	0·74

We see thus that in the dominant class the annual girth increase remains the same in thinned and natural forest, whilst the suppressed classes have doubled and trebled their annual growth immediately more light and space was afforded. If we take 0·75 inch to be average girth increase of a II. class sál tree in these forests, a period of 24 years would be necessary for a tree of 4½ feet girth to pass into the I. class, but it is probable that in other parts of India, where the sál forests stand in deeper soil and in more favorable circumstances as regards climate, the annual girth increase is considerably larger.

In the Kumaon sál forests the rainfall is about 70 inches, and the range of the thermometer from 30° to 105° Fahrenheit, in the shade.

S. EARDLEY WILMOT.

LIGHT GRAZING IN THE RESERVES IN THE PLAINS.

I HAVE from time to time read with interest the letters in the *Forester* regarding "light grazing" in the reserved forests; and I would now venture to say that the time has come for Government to take up this important question and form a decision as to whether grazing of cattle (excluding goats and camels) should be prohibited or not in the reserved forests, and there should be some definite rules laid down on this subject; it should not be left to the discretion of Conservators, who may hold widely different views in the different provinces, and thereby Government interests may be prejudiciously affected.

My own opinion, gained after an experience of many years of constant work in the reserved forests, is that, considering all the pros and cons, light grazing is decidedly beneficial than otherwise. It is of course understood that I do not include goats and camels. Some of the best forests I know of are where there is no restriction on grazing (goats excepted), neither is there any protection from fire, but the grass is so kept down that the fires cause little damage, and the reproduction from seeds as well as from shoots is very promising. Whereas *one* fire through the reserved forests does more damage than several decades of light grazing. Perhaps the saddest sight to a Forester is the condition of a reserved forest after a fire has passed through it. I wonder if all those who now hold the posts of Conservators have gone through a forest protected from grazing *immediately* after it is has been burnt; if they have I do not think they would advocate the total exclusion of grazing. The *best* arrangements cannot make sure against fires; on the contrary it speaks of itself for the good conduct of the people in the neighbourhood that such large areas are annually saved from

fire. Of all crimes about the *easiest* to perform and the hardest to detect is that of "forest firing."

My argument for allowing light grazing in all Government forest in the plains, due regard being had to times and seasons, is founded upon the following points :—

(1). Long grass prevents germination and chokes such seedlings as do come up.

(2). The injury caused to germination by light grazing of cows and bullocks is less than that caused by long grass.

(3). The experience already gained in the reserves shows that little natural reproduction takes place in the "open glades," and that the open spaces remain as blank as they were before protection took place.

(4). One fire in a forest protected from grazing causes more injury than a *very* long period of light grazing.

(5). Nature has not produced all this valuable grass to be wasted and destroyed each year without benefitting any one.

(6). Government loses some revenue by this prohibition of grazing.

(7). There is a certain amount of hardship inflicted thereby on the neighbouring people.

(8). A certain amount of expenditure now incurred on "fire protection" will be saved.

Of course where bamboos have seeded or for other special cause it might be necessary to stop all grazing for a few years, but otherwise I think it will be proved conclusively that the present system of entirely excluding cattle from certain reserves not only does no good, but is injurious to the formation of new forests.

A. J. C.

THE MYSORE FORESTS.

Extract from the speech delivered by the Dewan of Mysore, before the Representative Assembly on the 21st October last.

THE demand for sandal wood was unusually slack ; and the sales realized only Rs. 3,22,308, or 1¼ lakhs less than in 1883-84. This, however, was made good by the larger sale of timber to the public, and by the supply of fuel and sleepers to the railway. The forest revenue on the whole amounted to Rs. 6,57,564. (The expenditure for the upkeep of the establishment is Rs. 2,48,257 ; the net revenue from the forests is therefore Rs. 4,09,307). The important forest regulation is still under discussion ; the subject is surrounded by many difficulties, and this will be readily understood when it is said that in forest matters, even the British legislature, with its great experience, has not yet arrived at a final decision. The Forest Code is under revi-

sion in Bombay, the existing arrangements being deemed very unsatisfactory in the interests of the ryots. In Mysore the subject is at present receiving careful consideration. But I may here mention that the Government of His Highness the Maharajah will enforce as a fundamental principle that local wants, local customs and local systems of tenure should not be disturbed. On the other hand, however, it must be distinctly understood, as population and cultivation increase, it will be necessary for Government to interfere to prevent the wasteful destruction of forests, and to ensure their conservation in the best interests of the people. It will be strongly impressed on the minds of the forest officers that their aim should be to conciliate the villagers in forest tracts, and secure their co-operation by a liberal treatment in respect of their domestic wants.

In connection with forest legislation, I may add that, it is proposed to place the department under an Inspector General of Forests and Plantations. The Government are training three students in the Forest School at Dehra Dún for the post of Assistant Conservators, and it is proposed eventually to give an officer of this class to each district.

THE MAIPHAK.

Mr. Hearle has sent us the following from Professor Thiselton Dyer :—

"I have submitted your specimens to my colleague Professor Oliver, the keeper of the Herbarium. He reports :—

"1. The Maiphak of Assam is clearly *Evodia meliæfolia*, Bth. of the Flora Indica. The leaves of a specimen in the Kew Herbarium from Assam (collected by Masters) have the same hairs underneath on the midrib.

"I should imagine there must be plenty of the plant in the Calcutta Herbarium.

"2. The Cordia, collected by Mr. Lowrie in Ajmere, can only be identified as a form of *Cordia Myxa*, which in its present state is a variable species."

Kew :
October 12th, 1885.

THE DESTRUCTION OF PIGS.

Mr. F. O. Lemarchand requests us to state that the writer of the article on the destruction of pigs in our last Number has quite unjustifiably used his initials, and that having been the Hony. Secretary of the Lahore and Mian Mir Tent Club for 4½ years, he would be the last person to write such a paper. The use of Mr. Lemarchand's initials was evidently intended as a joke, but we must request correspondents in future not to use our pages for such a purpose.

II. REVIEW.

PROGRESS REPORT OF FOREST ADMINISTRATION IN THE PANJAB FOR 1884-85.

MOST Forest officers will concur in the opinion expressed in the resolution of the Local Government on the Panjab forest report for 1884-85, that the objects for which forest reports are published would be equally well served if the annual forms only, with a few explanatory remarks, were submitted to Government. His Honour the Lieutenant Governor appears, however, not to be aware that the present provisions of the Forest Code compel Conservators to treat the various divisions of forest work at some length in their annual reports, and Mr. Hill has merely followed those provisions in his interesting account of the forest work done in the Panjab during 1883-84 under his predecessor Mr. Ribbentrop.

But it is to be hoped that the rules on this subject in the next edition of the Code will be more in accordance with what is evidently the opinion of almost all local administrations. The present orders regarding the subjects to be treated in the annual forest reports seek to accomplish either too much or too little. They prescribe more details than are necessary to enable the higher officials of Government and the public to gauge the progress made in forest work during the year, and not enough to form a complete review, sufficient for the guidance and instruction of the Divisional officers, of the work done in each Division. Officials outside the Forest Department who have to read the forest reports are confused by a mass of, to them, uninteresting details; while forest officers learn little that they could not deduce for themselves from the annual statements. The work done in each Division and by individual officers might be annually reviewed and analyzed as minutely as is necessary through the ordinary medium of official correspondence, printed, if necessary, for future reference. The results accomplished are all that it is necessary to convey to the outside world.

The final sanction of the scheme for placing the management of all forest lands in the Panjab under the officers of the Forest Department acting as assistants to the District officers is the most important fact recorded in the report. The new system has not yet come into force, when it does considerable altera-

tions will, no doubt, be made in the organization of the executive, if not the controlling, establishment, as there are thirty-one civil districts and only twelve forest divisions. Important arboricultural works are being carried on in most districts, and these are at present managed, necessarily in a more or less haphazard fashion, by overworked district officers and their revenue subordinates. Little improvement can, however, be hoped for in their management by the addition of the fractional part of a forest officer to the controlling staff in each district. There is infinite scope for progress in this direction alone, and a Department which gave green shady topes to the dry plains of the Panjab would live in the greatful remembrance of the people. We trust that before long there will be a District Forest officer, even if of no higher grade than Forest Ranger where the forest area is small, in every district in the Panjab.

There has been practically no alteration in the area of the reserved forests during the year, and that portion of the first chapter which relates to boundaries is unnecessarily long and contains far too much detail as to the number of pillars built and repaired and so forth. But paragraph 26, in which it is stated that the forests in Kulu have been formed into *four* classes, *viz.*, *reserves*, 1st class and 2nd class *protected* forests and a *fourth* class, representing lands not included in either, requires some further explanation, as only one class of protected forests is mentioned in the Forest Act. Mr. Hill in stating "that the practicability of managing under separate sets of rules such a patchwork of forests (many small in area) as the settlement map discloses, must depend on the conciseness and simplicity of the rules" expresses his disapproval a great deal too mildly. Such a system can only bewilder the people and the forest subordinates, and bring forest administration into discredit, and it is the duty of the head of the Department to bring this to the notice of Government in clear and unmistakeable language. A similar system is now being introduced in the Rawalpindi Division, and if the Conservator of the Panjab quietly acquiesces he will be responsible for the mischief that will undoubtedly ensue.

It is to be hoped that the working plans brought out under the newly organized Working Plans Branch will be adhered to. From the remarks in the report it would appear that in past years Divisional officers have not paid sufficient attention to the working plans of their forests. Something can be learned from the results obtained from working under a plan, however bad, and it is better to follow such a plan than none at all. It would, however, appear that in drawing up some of the plans a most important factor, the market for the produce, was not considered.

It is stated in para. 45 that more than half the forest area in the Panjab has already been surveyed. This satisfactory result is explained in the succeeding paragraphs, from which it may be gathered that most of the so-called forest maps are merely com-

pilations from the utterly inaccurate village maps made, in many cases before the forest boundaries had been laid down, by the local patwaries. The Settlement authorities in the Panjab still employ these men, although their work is a reproach to modern civilization in India; but it says little for the progress made in forest conservancy that it should be necessary to include such worthless documents in the list of forest maps. It is to be hoped that the statement will be revised in the next annual report.

An attempt appears to have been made to revise the form showing the areas of the plantations, but apparently this was abandoned in despair. We would recommend a revision next year of the statement in form No. 49 showing the areas of the reserved forests. Under the heading "name of forest," the names of the Division, Range or Tahsil in which the forests are situated are indiscriminately given, instead of the real names of the forests, which are very rarely entered. From this statement it would seem that there are only 56 reserved forests in the Panjab, whereas we believe that there are several hundreds. The whole statement is worthless and confusing.

The number of cases brought into court is apparently on the increase year by year, having gone up from 716 in 1881-82 to 1,050 in the present year, the number of convictions remains fairly constant at 75 per cent. There is a large decrease in the cases of injury to forests by fire, which the Lieutenant Governor notices with satisfaction. In the Hazara Division the practice of setting fire to forests appears to be extending, and it will extend until district officials help the Forest Department very much more than they have hitherto done. A great deal may be attained by the closure to grazing of all lands burnt over and the suspension of rights for a term of years. There is a large increase in the number of cases of illicit felling, &c., but this may be due to increased vigilance on the part of forest officials.

In para. 72 the Conservator observes (and in his observations the Lieutenant Governor "fully concurs") that "prevention of offences by means of an understanding with the people is much more creditable than the constant recourse to law for punishment of offenders." No one will be inclined to dispute this; but it would, perhaps, be more to the purpose if the Conservator explained how it was to be done. Given an area which the Forest Department wishes to protect, and the villagers in the neighbourhood wish to use and enjoy, what arrangement is to be made? No doubt, the Guards, if allowed, will soon arrange matters, and very often do so. But if Forest Guards get the idea that they will not be looked upon with favor if they pound all cattle found trespassing, they will soon find a way of coming to "an understanding with the people" in a manner hardly contemplated. As regards the evidence being insufficient, to which the Conservator alludes, it can hardly ever be otherwise, for

generally a Guard, when he finds an offence committed can get no evidence of any kind as to who committed it.

In the Panjab, at present, owing to the weakness of the subordinate Forest establishment, and want of support from the District authorities, little more is done than to harass the people. The so-called closed areas are not closed to grazing, as the establishment is only strong enough to impound a considerable number of cattle and make itself thoroughly unpopular. If a much stronger executive and protective establishment cannot be employed it would be better not to attempt closing to grazing at all.

The whole of the information regarding forest fires could with advantage have appeared in a tabular statement; far too much detail is given in the report, in some cases in a very loose way wanting in facts.

The authority which the Financial Commissioner exercises over forest management in the Panjab, appears to be considerable, if rather vague and unsettled. In the Montgomery Division the very unusual course of opening reserves to cattle free of charge was ordered by that authority; the consequence being that some 50,000 cattle overran the reserves, and at the end of a month they were completely denuded of grass. It is well that the people should be helped in time of real scarcity; but to open reserves to free grazing in this way should not be lightly determined upon. The people will always breed just as many cattle as can drag out an existence on the grazing grounds. Opening the reserves will enable a greater number of worthless animals to exist for a time; but it is doubtful if it permanently increases the material wealth of the people. To restrict the grazing area and consequently the number of cattle, and increase the number of closed areas or fodder reserves from which they could draw supplies during the hot months would be better policy. The act will have a most injurious affect on forest conservancy in Montgomery, and we altogether fail to see why fees, however small, should not have been levied. Directly it became known that there was grazing to be had for nothing, every villager must have hurried his cattle up to the favored locality, and it will establish a most dangerous and vexatious precedent. There is evidently some friction with the Forest Department in this district, as the Conservator remarks that the Deputy Commissioner considers the exclusion of browsing animals from even a fractional part of the unreserved forests injurious to the interests of the people. This grazing question is one that requires more careful study than has yet been given to it.

There has been but a small increase under the head of "Regular Plantations," the area on 1st April stood at 15,367, and 86 acres were added (during the year) at a cost of Rs. 40,137; but the greater part of this amount is for Changa Manga Plantation. The total area at the end of year was 15,453 acres, and

has cost Rs. 6,56,575, or Rs. 42 per acre. Under cultural operations in forests 2,855 acres are shown as completely stocked at the end of the year, at a total cost of Rs. 73,145, or Rs. 25 per acre, which, if cost and area are correctly given, is a very moderate figure. But from the remarks made by the Conservator on the system which has hitherto prevailed in Kulu of estimating the planted areas, the accuracy of these figures is questionable. The section of the report dealing with artificial reproduction is far too long and crowded with unnecessary details, but some excellent remarks on the subject of natural reproduction are made by Mr. Hill, who clearly shows that it would not be possible in practice to re-stock the hill forests artificially, although he wisely refrains from repeating all the well worn arguments on this subject. His remarks are exceedingly opportune, now that a regular Working Plans Branch has been organized in the Panjab, and particularly as the method of clear fellings with artificial re-stocking has been strongly advocated in the Panjab. As a matter of fact this method when applied to the hill forests is not alone unnecessary and costly, but endangers the very existence of the forests, which would have been annihilated by this time had it been adopted in past years. As only one or two species of the many trees which compose the mixed deodar forests of the Panjab Himalayas are exploitable at present, the fellings necessarily extend over a very large area, and hitherto forest officers have failed to re-stock artificially more than a few acres at a time in one place, and that at a very considerable expenditure. To attempt to plant up the whole area felled over would swallow up the whole surplus forest revenue of the Province, and the attempt would certainly be a failure. Luckily there is no necessity whatever for adopting this method, although apparently some of the Panjab Forest officers hold the contrary belief. For in most cases in the hill forests the rainfall is abundant, vegetation is most exuberant, and natural reproduction, as a consequence, is easy and sure. The only argument worthy of the name that has ever been urged in favor of the method is that, as under it the whole marketable stock in the forest can be felled at one time, it is the only one by which it is profitable to exploit small forest areas in difficult situations at a long distance from the main line of extraction. But by taking the forest in time, it is easy to obtain by natural means a crop of seedlings under every tree it is desirable to fell, and thus the whole marketable crop can in most cases be removed whenever required. But it is very rarely necessary to do this, as the yield from selection fellings with a long interval between the successive fellings is generally sufficient to make it profitable to construct special roads for the extraction of the produce. As a matter of course artificial re-stocking is necessary when large blanks have to be re-stocked; but this is only required in special cases.

It is not quite clear with what object 200 kail trees were lopped to half their height in the Kulu Division, and the loppings given to zamindars for manure in place of the pine needles they are in the habit of removing as explained in para. 136 of the report. Nor is it understood why "suppressed deodar poles were cut out of very dense groups" in the Bashahr Division. It has hitherto been taught that in thinning young forests of the pole stage only those trees which injure or stand in the way of the trees selected for preservation for the future should be cut out, not the suppressed trees which do no harm. The thinning out of the trees, except inferior species, in selection worked forests, like those in Bashahr, is wholly indefensible and erroneous, and if it was necessary to mention the fact in the annual report it should have been noticed with disapproval.

Much space is taken up by minute details about exotic trees and negative results with gooseberries and raspberries, which might with advantage be kept out of the report altogether. It is perhaps interesting to know that the "ash are very erect and are growing fast" in the Kilba forest garden, but it is after all a petty detail unconnected with the forests. Satisfactory progress appears to be made in opening out the hill forests by means of roads at a small expense. But what useful purpose is served by printing the long statement of "check walls" (for what purpose is not stated) at page 4, is not apparent. In the upper rivers 4,617 trees were felled against 5,585 in 1883-84, of which only 3,979 were deodar. The receipts of timber in depôts have fallen off very largely owing to the failure of the floods, the decrease as compared with the previous year being no less than 4,92,638 cubic feet, so that it appears to be a matter for congratulation that the Conservator should have been able to show a surplus of Rs. 1,91,282. The gross revenue was Rs. 7,49,352, and the charges amounted to Rs. 5,58,070. We agree with the Lieutenant Governor that "on the whole these results appear to be satisfactory."

There is little to notice in the Government of India resolution on the report except the opinion expressed on the subject of the forest settlements, namely, that the reservation of forest lands in the Panjab would be less costly and make better way if the Settlement authorities confined themselves to their proper duties of fixing boundaries and disposing of claims for rights, and allowed the Forest Department to regulate the details of their management. If the Panjab is behind other Provinces in its forest organization, this is to some extent due to the fact that the Local Government has distrusted its Forest officers, and relegated the most important duties to the Settlement officials, who, however great their ability, are ignorant of practical forest management. Englishmen at home now recognise that a knowledge of forest management, any more than a knowledge of Engineering, or scientific farming, does not come by inspiration. But the settle-

ment of the Rawalpindi and Kulu forests, to which allusion has already been made, shows that these modern ideas on the subject of forestry have not yet extended to the Panjab.

SPAIN.—Under the reign of the Moorish caliphs the Iberian peninsula resembled a vast garden, yielding grain and fruit, of every known variety, in the most perfect quality, and in endless abundance, and thickly populated by a highly cultivated people. But then the sierras and mountain slopes were covered with a luxuriant growth of timber, which was afterwards wantonly destroyed under the rule of the kings. Large herds of half-wild goats and sheep prevented the spontaneous growth of trees on the neglected lands. Now nearly all the plateau-lands of Spain, being fully one-third of the entire area, are desert-like and unfit for agriculture, because of the scarcity of rain and the want of water. Another one-third of the territory is covered with worthless shrubs and thorn-bushes, and affords a scanty pasture for the merino sheep, the number of which is decreasing from year to year. The once delicious climate has become changeable and rough, since there are no more forests to break the power of the scorching Salano and the cold Galego wind. The average depth of the fine rivers that cross Spain in all directions has greatly diminished. The Government, well aware of the causes of the deterioration of the soil and climate, has lately made earnest efforts, partly to replant the old forest grounds, but has met with little success, it being very difficult to make trees grow on former timber land, which has been lying waste for a longer time. It will take a full century's time and necessitate an immense outlay of money to restock Spain with sufficient timber.—ROTHE.

III. Official Papers.

MEMORANDUM ON THE COLONIAL AND INDIAN EXHIBITION TO BE OPENED IN LONDON IN MAY 1886.

A Note on the space available in the Imperial Court for the Forest and Mineral Collections with suggestions as to subjects which would seem to deserve special attention.

Deducting the space occupied by paths, the floor space allowed for the Imperial Court amounts to only 4,240 square feet, with a wall space of 5,910 square feet.

His Royal Highness the Prince of Wales, in a letter enclosed in a Despatch from the Secretary of State for India, dated 12th February, 1885, states :—" Much interest is taken in this country in the woods of the various Colonies and Dependencies of the Crown, and I shall be glad if a good representation of those of India is made."

To carry out fully the wishes of His Royal Highness more space would be required than can be devoted to timbers, but it is understood that a fairly good collection will be shown and can be accommodated within the space available.

It is, however, impossible to give to the Forest Department the 3,500 square feet of floor space asked for by the Inspector General. After careful consideration, it has been found that only 400 square feet of floor space can be assigned to the Forest Department. This is shown in the accompanying Ground Plan* as Sub-Courts No. II. and III. These numbers should be given in Roman character, on the outside of each case containing timbers.

It is believed that the space asked for by the Inspector General of Forests was intended for the exhibition of all the collections made by the Department, *e.g.*, including Gums, Dyes, Tans, Fibres, Medicines, and Food-stuffs as well as Timbers. It has now, however, been finally agreed upon that collections of Minor Forest Products will be grouped with the corresponding exhibits obtained from all other sources. Thus, for example, the fibres collected by the Forest Department will appear in (XXII.); gums in (XXXIII.), and so on. While the Forest Department collections will be thus broken up according to a distinct system of classification, the names of the collecting officers will be clearly shown on each specimen.

The separate space allotted to the Forest Department in the

* Not reproduced.

Imperial Court will thus be occupied entirely by the collections of timbers, and it is therefore hoped that a floor space of 400 or 500 square feet, with a wall space of 1,000 square feet, will be found sufficient. This wall space will be available on the walls around the Sub-Courts numbered II. and III., but a further space of one foot in depth, running along the whole of both walls of the Imperial Court, will be devoted to timbers if found necessary.

Should the areas marked II. and III. with the wall space indicated be found insufficient, this might be increased by the erection of a triumphal gateway built up of blocks of wood, similar to that constructed at the entrance to the Forest Department Court of the late Calcutta International Exhibition. A gateway, if constructed, should face the transverse path A, and it might consist of one large arch and two smaller ones. It might be 25 feet in breadth, 10 to 15 feet in height, and 5 feet in thickness, and since it would stand isolated, it could be inspected on all four sides, thus affording much additional wall space for the display of blocks of timber.

An admirable suggestion has been made by Mr. Ribbentrop, Officiating Inspector-General of Forests, that a special trophy should be devoted to "Bamboo and its uses." This is provisionally shown in the Ground Plan in the form of a bridge, thrown over the middle of the transverse path B, between the Assam and Bengal Ethnology Sub-Courts. If constructed this trophy would thus be situated in the centre of the Imperial Court and between the two chief trophies, namely, cereals and fibres. Visitors walking along the longitudinal path F would have to pass over this bridge, and while studying the multitude of objects made of bamboo and the numerous forms of bamboo itself, which would be worked into designs on the bridge, they would at the same time command a complete view of the Court. By placing this bridge, so that it could be entered by the small central path only, crowding would be prevented. It might be built on four pillars each 2 feet square, placed in front of the corners of the four Ethnology Sub-Courts, and encroaching one foot on either side on the transverse path B, and one foot on the Ethnology Sub-Courts. The bridge would require to be square, the passage below being 7½ feet in height and the platform 8½ feet above the ground. It would, of course, in the first instance, require to be constructed of a strong wooden or iron framework, but like a rustic bridge, it might be completely covered over with bamboos. The approaches would be on the path F, and should be made by a series of steps, 9 inches in height and 1½ feet in breadth. A railing 2½ feet in height might be made entirely of bamboo passing up both sides of the stairs and over the bridge. The approaches would have to be open below, but they could be lined above and below with bamboo, and underneath the bridge, on the path F, might be placed

two rustic bamboo chairs, each 5 feet in length. These chairs could be hung all round with objects made of bamboo, such as fishing baskets, traps, knives, spoons, musical instruments, &c. These chairs would also command a view of the Assam and Bengal Ethnology Sub-Courts. The four pillars already described might rise to a height not exceeding 15 feet above the ground, and as they would occur on the four corners of the bridge they would be ornamental, and could be completely covered with bamboos. In recesses, constructed on the top portions of these pillars, might be shown glass-jars containing edible portions of bamboo, such as bamboo-grain and bamboo-shoots, the latter boiled like asparagus or preserved as *Chow-chow; Tabashir*, or the crystalline substance obtained from the interior of the bamboo culms might also be shown here. Bamboo-paper-fibre and bamboo-paper might find a prominent place. The approaches to the bridge could not of course be more than 5 feet in breadth, but the top of the bridge, by projecting one foot on either side beyond the pillars, would become 10 feet in length and breadth. Gates also constructed of bamboo might be placed at each approach, and to regulate the number of people allowed on the bridge should any difficulty arise from over-crowding, these gates could be locked and the structure by itself would still be attractive.

Of the Minor Forest Products, special attention might be directed to the following :—

1st.—FIBRES. These may be referred to two sections, *viz.* :—

(*a*). Fibres suitable for the textile industries, *e. g.*, for ropes and fabrics. The subject of silk substitutes is attracting attention at the present moment. Jute, which is a most perfect substitute for silk, has the disadvantage of being readily destroyed by moisture. A good and cheap fibre more durable under the influence of water than jute would command an immediate market. Rhea and other nettle fibres are also of great interest, but it would seem that a mistake has been hitherto made in concentrating all enquiries on rhea proper. The *ban-rhea* of Assam and many other allied nettle and rhea fibres deserve careful investigation, and it is hoped that large collections of all the Urticaceous fibres may be shown. The fibres from the *Malvaceæ*, *Sterculiaceæ*, and *Tiliaceæ*, also deserve careful investigation, and the Monocotyledonous fibres, *e.g.*, the aloe and pine-apple fibres, are daily growing more and more important. It is indispensably necessary that a small dried flowering and leafy specimen of the plant from which each fibre is prepared should be furnished whenever this is possible.

(*b*). Fibres suitable for paper-making. These require scarcely any preliminary preparation, and it is this charac-

teristic that has rendered Esparto and other grasses favourite paper fibres. They are placed in the vats and reduced to pulp direct. It would never pay to devote to paper-making even a fibre which may be separated as cheaply as jute, unless that fibre chanced to be quite useless for the textile industries, and thus fetched an exceedingly low price in the market. The paper-maker cannot compete with the spinner in the purchase of fibres. It is believed, however, that the subject of grasses and herbaceous plants suitable for paper-making has not as yet been thoroughly investigated. Questions of export must be borne in mind, unless the proposed fibre can be cheaply cultivated on accessible tracts of land ; but in cultivation paper fibres cannot compete with ordinary agricultural produce, so that the most likely fibre would be a wild one answering the requirements indicated above, namely, cheapness and quantity.

2nd.—Gums, Resins, Extracts, and Gutta-percha and Caoutchouc.

It is remarkable that the bulk of the resin consumed in India has to be imported, and it is believed the gum trade might be greatly extended. At the present moment the so-called East Indian Gum which reaches Europe from Bombay is almost entirely imported from the Persian Gulf and re-exported from Bombay. The trade in catechu requires careful investigation, and collections from all the forests of India showing chips of the wood before and after boiling, the extract in all its stages, the forms in which it enters the market, samples of the implements used in its preparation, statistical information as to the amount annually produced and market for which it is prepared, would be very valuable. Gum kino and gambier require to be similarly investigated and collections supplied. The subject of India rubber, or milky saps, which on hardening resemble either gutta-percha or caoutchouc, should be carefully looked into, and detailed information and specimens furnished.

As with fibres so to a greater degree with gums and the other articles alluded to in this paragraph, it is necessary to accompany the exhibits with dried samples of the plants from which they have been collected. A twig of the plant brought in by the Forest Ranger might be simply hung out to dry* in the sun, and then placed in the mouth of the bag or basket containing the corresponding economic product.

3rd.—The subject of Forest Dyes and Tans would richly reward careful investigation, and where possible the dye product

* For directions to dry such specimens, see a separate note, No. 5 of this series—"Hints as to making and despatching collections of Raw Products and Rough Manufactures."

exhibited should in each case be accompanied by samples of the mordants or dye auxiliaries used. A sample of dyed cloth and a note describing the process of dyeing would make the collections complete. Similar information would be most valuable in the case of tans.

Under the term "Extra Forest Products" might be included all wild fruits, leaves, roots or other structures eaten regularly or in time of famine only, by the poorer people; also all fodder grasses, bushes or trees. Fruits that cannot be sun-dried might be preserved in small bottles with spirits of wine or ordinary country spirit. All such collections must, however, be put in a separate box by themselves, for should the bottles get broken, oils, spirit, honey or other liquid samples would destroy completely fibres or other exhibits. Liquids should, therefore, be packed by themselves, the bottles being each wrapped up in waste jute or other fibre, and packed together in a small box. Specimens of food and fodder plants should be dried as directed; but small sheaves, sun-dried, would be most acceptable. Bees, hives, wax, honey, and ants, would also come under the head of Extra Forest Products, and as these are receiving much attention at present, collections would be highly prized.

If the honey is extracted, only combs quite free from young bees should be used for this purpose. The honey should be allowed to drain naturally from the combs. In addition carefully selected combs with honey in them should be placed in jars and sent in this form. Honey expressed from mixed combs containing insects, ferments rapidly and becomes useless. Indigenous hives, as used by hill tribes or wild hives, would be most interesting, and, as far as possible, a few bees corresponding to the combs or hives, should be preserved in spirit and numbered so as to allow of identification with the hives. The resin-yielding bees of Burma and Assam should be carefully collected and perfect hives should be screwed into separate wooden boxes so that they may arrive without being injured.

It is intended to make an effort to show the Indian ants. Some of these are regularly eaten by hill tribes, and ants'-nests would be most interesting; but, as with hives, samples of the corresponding insects should be carefully preserved. It is proposed to try and take one or two complete ant-hillocks, as these form in some forests a characteristic feature. One or two, 6 or 8 feet in height, carefully cut out and packed in separate boxes, would form an attractive show in the Forest Court.

The attention of Forest Officers might be specially drawn to the subject of Silk. Of all the Extra Forest Products this is by far the most interesting. The demand has arisen for a wild insect that may take the place to some extent of the mulberry silk insect, and there is no knowing which of the numerous obscure wild silks may be found the one most serviceable. All silk collections should as far as possible consist of specimens of

the plant or plants on which the worms feed; caterpillars or silkworms preserved in spirit in all stages of growth; eggs; cocoons both perforated and with live or with dead insects; specimens of the male and female perfect insects—these may be placed separately in small boxes tied together, three or four in a set, with one box filled with camphor—thread reeled or spun from the cocoons and cloth manufactured from them. Specimens of the crude appliances used by the hill people in their silk manufactures would also be highly instructive. Where an officer is prepared to give the subject of silk his special attention, the Revenue and Agricultural Department would be glad to place at his disposal special funds for this purpose. In all such cases application must first be made to the Exhibition Branch, stating what collections it is proposed to make and the amount of money necessary.

From the preceding remarks regarding silk, it might perhaps be inferred that only the silkworms known to the natives were required. The wild ones not at present used in any way would be quite as interesting, however, as those known to yield a useful fibre.

The Minerals occupy the Sub-Court marked XLI. Blocks of Stones and Building materials might also be arranged on the floor and against the wall, along the longitudinal paths E and G. In the despatch to which reference has already been made in the opening paragraph of these suggestions, His Royal Highness the Prince of Wales says :—"It is very desirable that the higher class Building Stones should be fully exhibited." Arrangements will be made to show to advantage the mineral collections which may be received; special attention is desired to the subject of marble.

GEORGE WATT,

On Special Duty with the Government of India,
Department of Revenue and Agriculture.

ENSILAGE.

As the experiments in ensilage conducted during 1884-85 at Allahabad in connection with the preservation of grass, were perhaps larger and more comprehensive than any experiments which ever took place at any other one place, I propose submitting a report showing generally the process of this method of the underground preservation of grass, and in detail the contents and outturn of the several silos dug in Allahabad Cantonments.

Eighty-four silos in all were dug, and filled with grass, &c., between 23rd July and 29th October, 1884. The dimensions of the majority of these were 30′ × 12′ × 6′, while the rest were of various sizes.

The silos were so situated, as to be in the centre of the plot,

from which it was intended the grass should be cut. This was done to avoid the necessity of engaging carriage to take the grass to the pits, and by these means the only expense incurred in filling the silos was the contract rate of cutting the grass, *viz.*, about 9 pie per maund.

It was found by experiment that a field or plot of about five acres of ordinary grass land, will fill a silo 30′ × 12′ × 6′ dug in the centre of it. The coolies who cut the grass will carry it and throw it into the pit.

The cost of three silos of the above size was Rs. 11, or at the rate of Rs. 1-11-2 per 1,000 cubic feet. In addition to Rs. 3-10-8 for excavating the silo, there is the charge for covering and uncovering it with 4½ feet of earth, which is about Rs. 1-5-4, and hence the total expense connected with a silo 30′ × 12′ × 6′ containing 600 maunds of grass should be about Rs. 5.

The principle on which these experiments were carried out, was to find out the very cheapest method of preserving grass, karbi, mothi, &c., so as to bring it within the power of the poorest villager to store food for his cattle. It was with this object that only earth silos were dug, no elaborate means of draining or pressing were attempted, the experiments were conducted in the simplest and cheapest form, and though a small percentage of the silos was not good, yet on the whole the experiment may be deemed to have been highly successful, and considering that the operations were nothing more than digging a hole in the ground, and filling it with grass, it is highly satisfactory that over 40,000 maunds of food so stored, should have been eaten, and eaten with relish by the cattle (numbering 1,000) and upwards of 1,200 ponies.

To examine the financial results of the above operations it will be seen that roughly speaking the silos containing these 40,000 maunds of fodder cost Rs. 350, and the cost of cutting the grass was Rs. 1,875, and thus giving even the liberal allowance of 40 lbs. per head per bullock per day, it would be possible to feed 80,000 cattle for Rs. 2,225, or in other words, to forage over 200 bullocks daily for a whole year at a total cost of Rs. 2,225, or at the rate of Rs. 11 per bullock per annum.

Now, at the most moderate computation, and giving only 20 lbs. per diem, it would cost to feed a bullock on bhúsa Rs. 45 per annum, or more than four times as much as the ensilage. This is taking the rate of bhúsa at 8 annas per maund.

The only precautions necessary in filling an earth silo, are to heap the grass as high above the surface of the silo, as the depth of the silo, and then to cover the grass so heaped up with the whole of the earth which has been previously excavated, care being taken to cover a margin of 2 feet all around the sides of the pit, to keep out air and water. With a few exceptions nearly all the Allahabad silos were filled while it was raining hard.

When a silo has been covered up great care must be taken in filling up any cracks or crevices the moment they happen to appear.

For the first twenty-five silos that were made an elephant was employed to press the grass, but subsequently the services of the elephant were dispensed with, and no pressure other than the weight of the excavated earth was used. The latter appears to be quite sufficient, and is the least expensive form of pressure that can be applied. It is of course highly important that the weight of the earth so put on should be equally distributed.

Another form of pressure that was tried was wooden sleepers; but unless great care is taken in placing the grass evenly, it is very difficult to obtain an equal pressure, as the sleepers being flat will naturally press only on the highest points of the grass. Our experience seems to show, that the earth pressure is all that is necessary, if carefully applied.

A most important result was obtained from 12 silos, which were made along the line of rail between Allahabad and Manauri, for though they were filled almost entirely with the coarsest description of grass, *viz.*, kúsa, kásá, and gánhra grasses, which make poor hay, yet the ensilage turned out excellent.

The coarse grasses came out of the silo soft and succulent, and that they were nutritious and palatable was proved by the condition of the bullocks during the issue of this ensilage, and by the greedy manner in which the animals devoured this fodder.

I think also that results proved that for the purpose of being siloed, grass should be cut either with the "jabao" (small circular scythe) or with the "hassa" (sickle), and not with the "kurpa," for with the latter it is almost impossible to avoid scraping up dirt and roots, which not only make the ensilage gritty and unpalatable, but also tend to cause it to have an obnoxious smell.

After opening the silos on the railway, we opened eleven that had been dug on the Fort Esplanade. These were formed from the following good grasses, *viz.*, bandari, janewah, mussél and dhúb, and turned out excellent. These grasses had been in the pits about six months, and came out as green as when put in.

I then had to open out the silos in New Cantonments. These did not turn out so well as those on the railway and fort, and three or four were so bad that they had to be closed again. The smell of this ensilage while in the pit was malty, but when removed and exposed to the air, it became unpleasant, resembling a tan-yard in smell. Most of it, however, was greedily devoured by the cattle, though some three or four silos could not be used.

The reason the silos in New Cantonments were not so good as the others can fairly be attributed to the fact that the grass put into them was immature and young, and from this the following deduction can be made :—Ensilage to be good should be

made from grass cut just before it flowers, and this will allow a good second crop to spring up for hay.

The Transport Lines in Allahabad are in every way inconveniently situated, being in what are called the Chatham Lines, three or four miles away from the barracks, Commissariat godown, and other places in which the bullocks are called upon to work. This necessitates most of the bullocks for duty having to walk four miles before their work is begun, and again to perform a return journey of four miles when their work is finished.

Carrying the ensilage to the Chatham Lines was fraught with a great deal of inconvenience, for to get there from New Cantonments necessitates passing through the greater part of the Civil Station, the inhabitants of which naturally complained of the smell of the ensilage. As soon as it was found that annoyance was being caused, the issue of ensilage to the animals in the Chatham Lines was stopped.

Ensilage has a curious smell, very like that of a tan-yard, which is unpleasant to any one unaccustomed to it, but which ceases to be unpleasant after one is used to it. There is nothing to show that the smell is at all unhealthy, on the contrary the coolies who were employed daily on the silos, kept in excellent health, and the siege train bullocks who were fed almost entirely on it, kept well and in very good condition. There was only one death amongst these animals, and that was caused by rinderpest. This epizootic disease spread considerably amongst the new bullocks bought for the proposed expedition to Quetta, and caused many deaths. The Commissariat slaughter cattle were fed almost entirely on ensilage, and nothing else, with the most favourable results. I mention this as an idea seemed to have gained ground, that the deaths amongst the new purchases were due in some way to the ensilage. This can hardly be maintained in the face of the following facts :—

(*a*). Siege train bullocks fed on ensilage from the time of the first silo being opened to the last being closed, kept well and in good condition.

(*b*). Slaughter cattle same result.

(*c*). Slaughter sheep fed partially on ensilage with good results.

(*d*). Ponies fed on ensilage.

I think it has since been incontestably proved, that the death among the new bullocks were due to rinderpest, and that this disease was raging in the villages round about Allahabad is well-known, and was witnessed by the Major-General and Deputy Assistant Quartermaster-General of the Division, who when out in the district, saw the corpses of many hundreds of bullocks that had been carried off by this disease.

I made an experimental silo with wonderfully good results. It was filled in the following manner:—At the bottom was placed about 2 feet of green "mothi," next some rather dry

múnj, on this came some 2 feet of chaffed sorghum, then a layer of dry karbi, pressed down by about 6 inches of green mothi, and on the top of all a layer of sorghum. This pit was opened on 13th May, 1885, after having been covered for 6½ months. Two inches sorghum at the top had to be discarded. The remaining articles came out most excellent, the dry karbi, appearing as juicy and fresh as the green. The animals devoured this ensilage in the greediest manner.

I attach a statement showing the result of each silo in detail, and in conclusion I submit the following summary of what would appear to be the facts ascertained in connection with this most interesting experiment, which was conducted on so large a scale at Allahabad this year :—

(1). It does not appear necessary to go to the expense of building masonry silos, or to take any particular precautions in draining and pressing, as an earth silo seems to fulfil all the necessary conditions, and apparently drains itself if kept air and watertight.

(2). The only pressure that seems to be necessary, is that caused by the excavated earth being piled on the grass.

(3). The best time to cut the grass is when it is mature, between 15th August and 1st November, this will give a second crop for hay.

(4). The fact of its raining while a silo is being filled, does not appear to do any harm.

(5). The ensilage should be issued green, *i.e.*, as it is taken out of the pit.

(6). Thirty-five lbs. of ensilage would appear to be equal to 20 lbs. of bhúsa, the ration of a siege train bullock.

(7). Ensilaged karbi forms good food for elephants.

(8). The fact of cutting the grass for ensilage, gives a finer and better second crop for hay-making.

(9). Silos should, in my opinion, be made wedge-shaped, *i.e.*, rather wider at the top than the bottom, and with sloping sides, to preserve an even pressure. The floor and sides might be baked by burning rubbish in the pit.

I trust that the experiments at Allahabad may in the course of time show the villagers and country people, that they have now a sure and safe means at hand for preserving fodder for their cattle, and a cheaper method by far of procuring good fodder than any now in existence ; and in conclusion I would point out that the success of these experiments is mainly due to the intelligence and hard work of Sergeant Meagher, of the Commissariat Department, who has not only been out in all weathers, but has taken an intelligent interest in the operations, which has gone far to make them so successful.

S. C. F. PEILE, *Captain,*
Asst. Commissary-General.

Silos dug in New Cantonment.

Date when covered.	Time taken in filling.	Dimensions.	Weather when filling.	Contents.	Kind of pressure.	Date when opened.	Remarks.
23rd July, 1884, ..	Hours. 3	Top 10′ 6″ × 5′ 9″, .. Bottom base 9′ 6″ × 4′ 3″, Depth 4′ 3″, ..	Raining hard,	116 maunds of immature grass,	3 feet of earth,	November 1884,	Ensilage brownish, smell unpleasant, issued after being dried.
29th July, 1884, ..	Days. 4	Top 30′ × 12′, .. Bottom 28′ 6″ × 12′, Depth 6′, ..	Do., ..	750 ditto,	Elephant pressure and 5 feet of earth,	11th Nov., 1884,..	Ensilage green and very wet A little at top and sides was bad, remainder issued green.
8th Aug., 1884, ..	2	30′ × 12′ × 6′, ..	Fair, ..	650 ditto,	Ditto,	21st April, 1885,	Ensilage green and wet, smell unpleasant, but issued and eaten in one day. Top and sides not issued, being bad.
10th Aug., 1884, ..	3	28′ × 12′ × 6′, ..	Very rainy,	525 ditto,	Ditto,	22nd April, 1885,	Ditto ditto ditto.
12th Aug., 1884, ..	4	Top 28′ × 10′, .. Bottom 27′ × 8′, .. Depth 6′, ..	Raining,	415 ditto,	Ditto and 4 feet of earth,	23rd April, 1885,	Ensilage good, green, and wet, scarcely any heat in silo.
8th Aug., 1884, ..	3	30′ × 12′ × 6′, ..	Raining night and day,	800 ditto,	Ditto and 5 feet of earth,	Not yet opened. ..	

10th Aug., 1884, ..	2	30′ × 12′ × 6′, ..	Raining,	850 ditto,	Ditto, ..	Ditto, ..	..
12th Aug., 1884, ..	2	Top 30′ × 12′ Bottom 28′ 6″ × 10′ 6″ × 6′, ..	Very rainy,	750 ditto,	Ditto, and sleepers laid across,	April 1885, ..	Ensilage on top for 3 feet bad, wet, and jammed up into cakes; color black, smell offensive, heat 105°, not issued.
12th Aug., 1884, ..	2	30′ × 12′ / 29′ × 11′ × 6′, ..	Raining,	750 ditto,	Ditto, no sleepers,	1st February, ..	Green, wet, and good, no heat in silo.
12th Aug., 1884, ..	2	Top 29′ 6″ × 12′ Bottom 28′ × 10′ × 5′ 6″, ..	Very rainy,	650 maunds of rather ripe grass,	Elephant and 5 feet of earth,	May 1885, ..	Ensilage excellent, issued in one day, color green, heat 90°.
13th Aug., 1884, ..	2	Top 30′ × 12′ Bottom 27′ × 8′ × 6′, ..	Fair, ..	670 maunds of immature grass,	Ditto, ..	Not opened. ..	..
14th Aug., 1884, ..	3	24′ × 10′ × 6′, ..	Raining,	650 ditto,	Ditto, ..	..	Ensilage excellent, issued in one day.
15th Aug., 1884, ..	4	30′ × 12′ × 6′, ..	Very rainy,	640 ditto,	Ditto, ..	April 1885, ..	Left open 2 days after being filled. Little on top of sides bad, otherwise good.
19th Aug., 1884, ..	2	32′ × 12′ × 6′, ..	Fair, ..	650 ditto,	Ditto, ..	May 1885, ..	Very good, no heat.
20th Aug., 1884, ..	3	30 × 12′ × 5′ 9″, ..	Do, ..	700 ditto,	Ditto, ..	Ditto, ..	Very good, 105° Fahr.
21st Aug., 1884, ..	4	30′ × 12′ / 29′ × 12′ × 5′ 8″, ..	Do., ..	800 ditto,	Ditto, ..	April 1885, ..	Color black, ensilage bad and jammed into cakes. Water must have got into this silo.
21st Aug., 1884, ..	2	30′ × 12′ / 26′ × 8′ × 6′, ..	Do., ..	400 ditto,	Ditto, ..	May 1885, ..	Good, 105° Fahr.
28th Aug., 1884, ..	2	30′ × 12′ / 29′ × 11′ × 6′, ..	Do., ..	700 ditto,	Ditto, ..	April 1885, ..	Ensilage good, smell pleasant and sweet, scarcely any heat.

Soils dug in New Cantonment—(continued).

Date when covered.	Time taken in filling.	Dimensions.	Weather when filling.	Contents.	Kind of pressure.	Date when opened.	Remarks.
	Days.						
28th Aug., 1884, ..	2	{32' × 12' / 30' × 8'} × 5', ..	Fair,	752 maunds of immature grass,	5 feet of earth only,	April 1885, ..	Green and wet, fair ensilage 90° Fahr.
30th Aug., 1884, ..	3	40' × 16' × 6', ..	Do.,	1,400 ditto,	7 feet of ditto, ..	March 1885, ..	Filled with long coarse grasses. Ensilage excellent, smell sweet, 110° Fahr.
30th Aug., 1884, ..	2	30' × 11' × 6', ..	Do,	720 ditto,	5 feet of do.	Ditto, ..	Ditto ditto.
3rd Sep., 1884, ..	5	30' × 12' × 6', ..	Very rainy,	652 ditto,	Elephant and ditto,	April 1885, ..	Smell unpleasant, heat 85° Fahr. Ensilage fair.
3rd Sep., 1884, .	4	30' × 12' × 6', ..	Do.,	732 ditto,	Ditto, ..	Ditto, ..	Ditto ditto.
31st Aug., 1884, ..	2	30' × 12' × 6', ..	Rainy,	700 ditto,	5 feet of earth only,	Ditto, ..	Ditto ditto.
2nd Sep., 1884, ..	3	30' × 12' × 6', ..	Do.,	800 maunds of nearly ripe grass,	Ditto, ..	May 1885, ..	Ensilage excellent, smell vinous, 95° Fahr.
3rd Sep., 1884, ..	2	30' × 12' × 6', ..	Do.,	820 ditto,	Ditto, ..	21st April, 1885,	Ensilage excellent, smell vinous, temperature cool.
5th Sep., 1884, ..	1½	30' × 12' × 6', ..	Fair, ..	761 ditto,	Ditto, ..	April 1885, ..	Ditto ditto.
5th Sep., 1884, ..	2	30' × 12' × 6', ..	Do.,	765 ditto,	Elephant and ditto,	Ditto, ..	Ensilage inferior, color black and jammed into cakes. Water must have got in or possibly too much pressure.

6th Sep., 1884, ..	1½	18′ × 18′ × 9′, ..	Fair, ..	1,100 maunds of almost ripe grass,	Earth on top, ..	3rd April, 1885,..	Ensilage excellent, pit cylindrical in shape, color green. No heat. The best silo opened.
8th Sep., 1884, ..	3	30′ × 12′ × 6′, ..	Do., ..	707 ditto, ..	5 ft. of do.,	April 1885, ..	Ensilage good, green, and wet. Temp. 90°.
8th Sep., 1884, ..	3	30′ × 12′ × 6′, ..	Do., ..	800 ditto, ..	Ditto, ..	Ditto, ..	Ditto ditto.
9th Sep, 1884, ..	2	30′ × 12 × 6′, ..	Do., ..	750 ditto, ..	Ditto, ..	Ditto, ..	Ditto ditto.
9th Sep., 1884, ..	2	30′ × 12′ × 6′, ..	Do., ..	800 ditto, ..	Ditto, ..	Ditto, ..	Ditto ditto.
21st Sep., 1884, ..	7	30′ × 12′ × 6′, ..	Rainy,..	693 ditto, ..	Ditto, ..	May 1885, ..	Good, color brown, smell sweet, 108° Fahr.
20th Sep., 1884, ..	3	30′ × 12 × 6′, ..	Fair, ..	527 ditto, ..	Ditto, ..	Ditto, ..	Very good, quite different smell, 105° Fahr.
28th Sep., 1884, ..	4	30′ × 12′ × 6′, ..	Rainy,..	688 ditto, ..	Ditto, ..	27th March, 1885,	Made of coarse grasses, smell very vinous. Heat about 110° Fahr.
4th Oct., 1884, ..	2	30′ × 12′ × 6′, ..	Fair, ..	733 ditto, ..	Ditto, ..	30th March, 1885,	Same as above, ensilage drier.
8th Oct., 1884, ..	2	30′ × 12′ × 6′, ..	Do., ..	476 ditto, ..	Ditto, ..	April 1885, ..	Ditto ditto.
4th Oct., 1884, ..	2	30′ × 12′ × 6′, ..	Do., ..	611 ditto, ..	Ditto, ..	29th March, 1885,	Ditto ditto.
6th Oct, 1884, ..	3	30′ × 12′ × 6′, ..	Do., ..	633 ditto, ..	Ditto, ..	March 1885, ..	Ditto ditto.
4th Oct., 1884, ..	5	30′ × 12′ × 6′, ..	Rainy,..	700 ditto, ..	Ditto, ..	April 1885, ..	Color brown, ensilage dry and good, smell sweet, heat 110° Fahr.
9th Oct., 1884, ..	3	30′ × 12′ × 6′, ..	Fair, ..	750 ditto, ..	Ditto, ..	Ditto, ..	Ditto, heat 130° Fahr.
12th Oct., 1884, ..	3	30′ × 12′ × 6′, ..	Do., ..	800 ditto, ..	Ditto, ..	Ditto, ..	Ditto ditto.
13th Oct., 1884, ..	3	30′ × 12′ × 6′, ..	Do., ..	Kurbi, ..	Ditto, ..	Ditto, ..	Kurbi, ensilage was excellent, almost the same color as when put in.
24th Sep., 1884, ..	5	30′ × 12′ × 6′, ..	Do., ..	Bajra, mothi múnj, ..	Ditto, ..	Not yet opened...	
29th Oct., 1884, ..	4	30′ × 12′ × 6′, ..	Fine, ..	Sorgham, mothi, kurbi,	Ditto, ..	May 1885, ..	Ensilage excellent, heat 100° Fahr. The best ensilage made, devoured greedily by animals.

Silos dug in the Chatham Lines.

Date when covered.	Time taken in filling.	Dimensions.	Weather when filling.	Contents.	Kind of pressure.	Date when opened.	Remarks.
	Days.						
16th Sep., 1884, ..	3	30′ × 12′ × 6′, ..	Rainy,	650 mds. immature grass,	Elephant & 5 ft. earth,	April 1885, ..	Ensilage good, all alike, color green, smell vinous, heat 90° Fahr.
21st Sep., 1884, ..	4			700 ripe, ..	5 feet of earth only, ..		
17th Sep., 1884, ..	3			756 do., ..			
22nd Sep., 1884, ..	6			550 do., ..			
20th Sep., 1884, ..	3		Fair, ..	750 do., ..			
24th Sep., 1884, ..	2		Rainy, ..	706 do., ..			

Silos dug on the Fort Esplanade.

11th Sep., 1884, ..	2	30′ × 12′ × 6′, ..	Fair,	737 mds. mature grass,	5 feet of earth only.	In March and April 1885.	Ensilage excellent throughout, green in color. Smell sweet, heat alike throughout, about 90° Fahr.
13th Sep., 1884, ..	2			750 ditto, ..			
12th Sep., 1884, ..	2			745 ditto, ..			
12th Sep., 1884, ..	3			768 ditto, ..			
13th Sep., 1884, ..	1			650 ditto, ..			
21st Sep., 1884, ..	1		Rainy,	716 ditto, ..			
23rd Sep., 1884, ..	2			649 ditto, ..			
22nd Sep., 1884, ..	1			504 ditto, ..			
24th Sep., 1884, ..	2		Fair,	440 ditto, ..			
17th Sep., 1884, ..	2			618 ditto, ..			
20th Sep., 1884, ..	3			434 ditto, ..			

Silos along the Line of Railway.

3rd Sep., 1884, ..	4	30′ × 12′ × 6′, ..	Rainy,	600 mds. mature grass,	5 feet of earth only.	In Feb. and March 1885.	The whole of the ensilage though composed of coarse grasses, was excellent. Light green in color, sweet in smell, and greedily devoured by the cattle. Heat 90° Fahr.
6th Sep., 1884, ..	4			650 ditto, ..			
8th Sep., 1884, ..	4		Fair,	700 ditto, ..			
12th Sep., 1884, ..	4			600 ditto, ..			
12th Sep., 1884, ..	3			550 ditto, ..			
16th Sep., 1884, ..	2			557 ditto, ..			
18th Sep., 1884, ..	2			535 ditto, ..			
21st Sep., 1884, ..	2			591 ditto, ..			
23rd Sep., 1884, ..	2			550 ditto, ..			
25th Sep., 1884, ..	2			565 ditto, ..			
30th Sep., 1884, ..	6	40′ × 16′ × 6′, ..		900 ditto, ..			

About 10 silos still remain unopened, as an experiment to see what they will be like next year. Not included in this statement.

IV. Notes, Queries and Extracts.

FOREST CONSERVANCY AT HOME AND ABROAD.

The report of the Select Committee "appointed by Parliament to consider whether by the establishment of a forest school, or otherwise, our woodlands could be rendered more remunerative," has just been issued, bearing the date of July 24th, and they express the opinion that so near the end of the Session it would not be in their power to conclude their investigation. They could only report to the House the evidence already taken, and recommend that another committee on the same subject should be appointed in the next Session of Parliament. It will be inferred from this that no decision was arrived at, and the vexed question of establishing a school of forestry for educating young men exclusively for the pursuit of that science, remains practically in the same state as before.

But although the sittings of the committee were inconclusive, the mass of evidence collected from experienced authorities and from various lands, leaves little doubt on the mind of the reader of the report that the investigation will terminate in any other way than by approving the inauguration of an endowed institution, where forestry can be taught and some sort of degrees or distinctions conferred, as in the schools and colleges for other objects. The committee, under the presidency of Sir John Lubbock, was only nominated on the 8th of July, and it held its last sitting (of three) on the 24th. At the first assemblage only one witness was examined. Mr. W. G. Pedder, head of the Revenue Department of the India Office, through whose hands all the forest papers from India pass, and who has had a good deal to do with forests as Secretary to the Bombay Government.

No attention was paid, it seems, to the forests of India until 1846, when a department was organised in the Bombay Presidency, under the late Dr. Gibson, "principally with a view of providing and securing supplies of teak timber for the dockyards." In 1847 the Madras Presidency followed suit, and the organization extended to Bengal and Burmah, and from that date the systematic conservancy of the forests of India may be said to have begun.

Mr. Pedder found some difficulty in stating what the revenue derived from forests was before that time, but he understood it

to be about £50,000. At all events in a year or two it arose to £150,000, and in 1859 to £182,000; the charges were £32,000, and the net revenue £150,000. In 1883-84 the gross revenue was £938,000, the charges £567,000, leaving net revenue £371,000. The training of Indian forest officials scientifically began about 1863, since which not only has the revenue thence derived greatly increased, but the capital value of the forests has increased still more, chiefly, it is intimated, as a consequence of these appointments. These officials, it appears, were sent to Europe for their training—chiefly to France and Germany, not to England, which was not supposed to be capable of affording them sufficient opportunities of scientific forest learning, and for the last ten years the Indian forest officers have been trained at the Ecole Forestière at Nancy. The fees, it seems—which cover board, lodging, and the requisite lectures, everything in fact but pocket-money—amount to £180 per annum; and two years' attendance are thought necessary to make an efficient forester, but only for the higher grades of the service, such as those of "Conservator, Deputy Conservator, and Assistant Conservator. There is a special school in India for the instruction of the inferior grades." Now it is arranged that "young officers—from five to seven or eight a year—are to be selected, subject to a physical test, by a competitive examination held by the Civil Service Commissioners. The young officers selected are to be sent for two years to go through a course at the Royal Indian Engineering College at Cooper's Hill, and there will receive instruction in mathematics, applied mathematics, geometrical drawing, freehand drawing, surveying, descriptive engineering, inorganic chemistry, geology, French, physics (laboratory work)," and a good deal besides, including forest subjects, botany, &c., to be studied in Windsor Forest and other places, and a holiday tour in France each year in connection with the school at Nancy. As yet it seems there have been no applications for these honours, but Mr. Pedder remarks that "any young men whose parents will pay the fees will be able to avail themselves of the instruction given in forestry." It is also stated that since 1867, when the system began, to 1885 there have been 511 competitors in India for the forest service, of whom 110 have been appointed, all from the United Kingdom, "excepting one or two Eurasians—East Indians." From this it would appear that every student of forestry at the college, Cooper's Hill, has a fair chance of an appointment in India. The odds are not four to one against him. Here, in England, every competitor for a Government appointment is likely to have twenty to one against him; and who knows how much favouritism besides? The Indian forests, it seems, have disappeared in an extraordinary manner before the advances of civilization, besides the immense demand created by the railways for timber, especially for fuel, sleepers, &c. Gingera, on the

west coast of India, is a small State 40 miles long by 15 to 100 miles wide, which, except the rice land, was entirely covered with forests as lately as twenty years ago; and seven years later, when Mr. Pedder went there as Political Agent he found that three-fourths of the forests had been entirely destroyed by the demands of the city of Bombay. The land, apart from creeks, &c., is about 400 square miles. The area of British India, exclusive of Native States, is estimated at 865,000 square miles, and of these 48,000 have been brought under conservation as Government forests. Besides 27,000 square miles, which are partially conserved as protected district or village forests, about 9 per cent. of the whole country, has now been reserved as woodland and saved from certain destruction, which is considered a remarkable fact, and greatly to the credit of the Indian Forest Department. At page 9 of the report, question 124, we learn that India is almost entirely dependent on wood for fuel. But so was Europe ages ago.

The expense of a school of forestry in this country, as a Government establishment, would not exceed, in Mr. Pedder's opinion, £4,000 a year.

At the next sitting, on the 21st July, Colonel Michael, C.S.I., was examined. He had seen seven years service in the early days of Indian forest conservancy, but was driven away by jungle fever, and has paid attention to forest preservation and progress ever since. He stated that he had himself seen "a well known perennial stream dried up completely on the slopes of the Nilgiris by the fact that the timber all round it had been cut for coffee planting." The circumstance of the timber being cut is but scant evidence that the spring dried up in consequence. Might not the coffee plantation have something to do with it? But all the witnesses appear to have faith in that theory, though the springs do not dry up in those parts of Ireland which have been entirely denuded of trees. And in America the doctrine is often stoutly denied by men whose experience is no less than that of those who maintain it. Colonel Michael admits that he never knew the planting of a forest to have restored a spring, though he has known many springs lost from a forest being cut away. There may be other causes yet to seek for an explanation of this phenomenon. This witness thought that the establishment of a school of forestry in this country would be of great advantage to it.

At the last sitting of the Select Committee on July 24th, Dr. Hugh Cleghorn, M.D., F.R.S.E., who was twelve years conservator of the Madras forests, and began when Dr. Brandis began in Burmah, was examined. He has since his retirement from the service in 1869 paid great attention to the subject of forestry both in England and Scotland, and he considered it marvellous that means had not been taken at an earlier period to place our forests under trained officials in order to preserve them.

Dr. Hugh Cleghorn answered very carefully the leading questions that were put to him by the members of the Committee, but through all there was evident a steady belief in the great advantage the country would derive from a more methodical system of forest conservancy by means of an institution for promoting the knowledge and encouraging the study of forestry.

After him Colonel Pearson was called in, who represented the Indian Government at the school of Nancy for eleven years, and has great knowledge of the system of forest conservancy as practised in France. He also is a believer in what is called an approaching "timber famine," and therefore strongly advocated the promotion of new plantations in Great Britain, and the establishment of a school of forestry. Asked if the great bulk of the woodlands were not in private hands he admitted that they were, which of course would render it difficult for the State to deal with them. But there are hundreds of thousands of acres in this country still which might easily be acquired by the Government for planting as being at present entirely unproductive. We could point to thousands of acres of this sort within 30 to 40 miles of London, say between Woking and Winchfield on the South-Western Railway line, consisting chiefly of a fine white sandy surface, which seems never to have produced anything since creation, except heather, but in which oak, larch, spruce, Scotch fir, and birch will grow and make fine trees if planted. In bringing these lands under cultivation, or forest culture, employment would be found for an immense number of people, and the wonder is that they have only been tilled in small patches, and by cottagers mostly, but always with success, where the experiment has been made. To bring them into cultivation is estimated to cost about £10 an acre in labour and breaking through the hard subsoil, about a spade depth below the surface.

The examiners asked Colonel Pearson if he did not think a good deal of useful forest knowledge might be obtained by two months' attendance at a school of forestry instead of two years, which few would be able to avail themselves of except in the higher branches of the employment. He answered that in three months so much information might be acquired as would fit a student for a useful position, but not in less. Lectures might be attended at the discretion of the applicant, who might learn as much as he thought would be useful to him and no more. The institution would probably have to provide for this sort of desultory teaching, much on the system of day-boys at a public school, who do not obtain the same care in instruction and superintendence as the regular boarders, and pay less for it.

Mr. W. T. Thistleton Dyer, C.M.G., F.R.S., Assistant Director of the Royal Gardens at Kew, then gave his evidence. This gentleman's opinions of the great utility of a school of forestry

in this country, after the plan of those in Germany and France, coincided with those expressed by the witnesses who had preceded him, and he thought if such school of forestry were established there would be applications, by and by, from our colonies for competent men to investigate the state of their forests, with a view to other regulations in regard to them. The Cape Colony, from his testimony, has been very prodigal of its forest produce, and the amount of forest which exists there has been reduced to very small limits indeed.

It is a mistake, though, to assume that because a country imports timber from Scandinavia or America it is a sign of a scarcity of timber at home. Timber once afloat can be carried long distances by sea at less expense than to cut and haul a few miles by land, and the system of the timber-exporting countries is so complete that every convenience and facility for its transference is reduced to the smallest cost, and it is delivered, as it were, at your doors ready for use without any care or personal superintendance of yours till you absolutely see it there. Set this against going into the woods, if only ten miles away, and cutting down and getting home through every sort of inconvenience a hundred loads of timber which you are permitted to take for nothing where it grows.

The evidence of Mr. Julian C. Rogers, Secretary to the Surveyors' Institution, closed the sitting, and was much to the same effect as the others.

Our limits warn us that we must leave this interesting subject for a future occasion. But we cannot close our observations on the report before us without some reference to the Appendix, a well-written paper, and very comprehensive, on British forests, supplied by M. Boppe, Inspector of French Forests, which should have a separate notice, and is worthy of being printed in a pamphlet by itself, as very interesting to all who take an interest in British forestry. We must make reference to it again, as we have only room to express our approbation of its style and utility here. This paper was handed in by Mr. Pedder, but not as a translation. It is, nevertheless, difficult to imagine that it was not written by an accomplished Englishman. It is unexceptionable in the grammar and the idiom of our language.

The Report is printed by Hansard & Sons, and may be had for the usual price of Parliamentary papers, 7½*d*. It contains 52 folio pages in good readable type, 7 of which are occupied by the Appendix, and may be had through any bookseller.—*Timber Trades Journal.*

At the recent Railway Congress at Brussels the question whether it would be economical and desirable to use iron or steel instead of wooden sleepers was fully discussed. It was

stated that metal sleepers of various patterns are being used in Holland and India to a considerable extent, and that they are being tried experimentally in Belgium, England, and other countries. An opinion was expressed that sleepers of the description which is being tried in England would afford good material support for the rails on main lines, although some inconvenience might be felt from a quoin of wood being used with it. It was also considered that other metal sleepers which are being tried in Holland and elsewhere had given satisfactory results. The cost of metal sleepers is higher than that of wood. They require good ballast, and there had not been sufficient experience from their use, in regard to their duration and maintenance, to enable the section to state specifically the relative advantages of the new description of sleepers. It was therefore considered that further experience is necessary. The difficulty of arriving at a conclusion as to what would be applicable in all countries and under all circumstances was exemplified in the discussion of this subject by the representative of the Egyptian railways. He stated that iron or steel sleepers cannot be economically used in Egypt, because they become corroded by the sand. The representative of the Indian railways, on the other hand, informed the section that iron or steel sleepers only can be used in India, because the white ant destroys wooden sleepers. Considerable discussion took place as to the construction of railways in regard to the curves, gradients, and works generally, including the question whether lines with a comparatively small traffic should be laid with heavy or light rails. It was, however, found impossible to lay down any general propositions which could be adopted under all the circumstances in which railways have to be made.—*Nature.*

MECHANISM OF A TREE.—A tree (and I beg my readers to follow this attempt at explanation closely—all depends upon it) receives its nourishment from the roots. These correspond to the mouth in the human frame. Now, as in the human frame the nourishment received is, after being supplied to the blood, exposed to the operation of air in the lungs before it is fit to give material to the body, so in a tree, the nourishment taken in at these tree mouths, the roots, passes to the lungs of the tree, and there, by contact with the air, is rendered fit to supply fresh material to the tree. These tree lungs are the leaves. This operation is affected by the passage upward from the soil around the roots, through the trunk, the branches, and every twig of the tree to the leaves, of a large quantity of water, containing in solution the nutriment for the tree. Arrived at the leaves, a process takes place which separates, by means of contact with the air, most of the water the roots had taken in, from the valuable nutriment, and throws off, in vapour, the surplus

water into the air. At this time certain constituent portions of the air are utilized and mingled with the nourishment retained. This is all, now a small portion in comparison with what had arisen from the roots, yet retaining enough water to serve as a vehicle back, is returned toward the roots, depositing in its way, in leaf, bark, and root, what is needed there for the growth of the tree. In these, they undergo, especially in the bark, further fitting and digesting processes before they assimilate with the substance of the tree. The water which was retained to carry them down, being no longer needed, passes out at the roots. . . . In the back of the leaf are numerous stomates or mouths. . . . Of the extent of the provision made for evaporation by the leaves, some idea may be formed from a consideration of the number of *stomata* or stomates to be found in the leaves of plants. The number varies in different plants, for which variation a reason may be found in the different conditions of growth to which they are subjected in their several natural habitats. In the back of the leaf of the apple tree there are about twenty-four thousand stomates to the square inch. In the leaf of the lilac there are a hundred and sixty thousand of them to the square inch. In the leaves of the cherry-laurel there are none on the upper surface of the leaf, but ninety thousand have been counted on the lower surface—PHIPPS.

THE PYRENEES.—The desolation of mountain regions by the clearing of forests is strikingly illustrated in the Pyrenees. Formerly the plains were cultivated, and inundations were much less frequent and less destructive than now-a-days. As roads came to be opened the profit from sheep and cattle became greater, and the clearing of forests was begun to make room for pasturage and, to some extent, for timber, until by degrees the slopes of the mountains were denuded, and the rains, having nothing to hinder, began to form eroding torrents, the south slopes suffering most, because first cleared and directly exposed to the sun's heat. The extremes of flood and drought became excessive, and extensive tracts have been ruined for present occupation from this source.—PHIPPS.

V. EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

Nil.

2.—CALCUTTA GAZETTE—

The 10th October, 1885.—Under the powers conferred upon him by section 75 (*d*) of Act VII. of 1878, the Lieutenant-Governor is pleased to make the following rules to regulate grazing in the reserved forests of Darjeeling:—

Rules.—1. Grazing in the reserved forests of the Darjeeling Forest Sub-Division other than those north of the Little Rangit river is prohibited, except under the following rules and conditions.

2. Permits for grazing will be issued by the Forest Officers in charge of ranges, hereinafter referred to as range officers, for the calendar month, on payment of such fees as may from time to time be fixed by the Conservator of Forests, with the sanction of Government. The permits will fix the block or locality in which the privilege of grazing may be exercised: such blocks or localities shall be selected by the Divisional Forest Officer with regard to the protection of the forest, the convenience of the permit-holder, and the existing orders of Government on the subject, or orders which may in future be issued by Government.

3. He shall not be obliged to allow grazing in any given block to more than one head of cattle to every 10 acres of area, but on the other hand may locate any number of cattle in a block, provided the area available for grazing in that block be five acres per head.

4. Grazing will be reserved for milk cattle required for the supply of milk and butter to the public in Darjeeling, Jellapahar, and Jore Bungalow, and for a number of draught cattle not exceeding 150 head.

The Divisional Forest Officer will not be bound to provide grazing for any cattle other than the above, but may, with the sanction of the Conservator, allow temporarily a larger number if he considers it can be done with due regard to the interest of the forest.

5. The construction of grazing camps, enclosures, or bathans is prohibited, except on the sites pointed out by the Divisional

Forest Officer. Sites for two bathans shall be allowed to each grazier whose permit allows him to graze more than five head of cattle. Should more be required, or a change of site applied for, the question to be decided in case of dispute by the Divisional Forest Officer and Deputy Commissioner.

6. In the cases in which the two bathans allotted to a permit-holder lie in two different blocks, he shall not leave one for the other without previous notice to the range officer, and without having the permission of this officer endorsed on the permit.

7. For the construction of, and repairs to, these bathans, permit-holders may utilize such dry fallen wood as may be found in the vicinity, and, with the permission of the range officer, canes and bamboos. Should sufficient dry wood not be available, the Divisional Forest Officer, or his subordinate under his orders, may mark and allow to be cut for this purpose trees of the less valuable kinds of smaller girth than 18 inches on prepayment of annas 4 per tree. No charge will be made for canes, bamboos, or dry wood.

8. The Divisional Forest Officer may prohibit the construction of bathans for draught cattle.

9. The cutting and lopping of trees is prohibited. This rule does not apply to bamboos, creepers, and the trees known as *Dung-Dung* (*Brassiopsis Hamla*) and *Dudhia* (*Ficus gamella*).

10. Payment for permits for grazing will be made in advance on the first day of the month, and in case of payment not being made by the 10th, double fees may be charged; if not made by the 20th, the cattle may be driven out of the forest, or the defaulters prosecuted under section 25 (*d*) of the Indian Forest Act, and the issue of a permit refused, subject to appeal to the Conservator. Should the Conservator consider it desirable, payments may be made quarterly, but subject to the above provisions as to payment.

11. Buffaloes, goats, and sheep will not be allowed grazing in the forests forming the circles to be worked for the supply of fuel and timber to Darjeeling, Jellapahar, and tea plantations.

12. All permits will be kept at the bathans, and will be produced for inspection whenever called for by any Forest or Police Officer. On the expiry of the term for which a permit is issued, it shall be returned to the office of issue, and a fresh permit may be refused, unless the applicant produces his expiring or expired permit.

13. The range officer shall, after issue of a notice to any holder of a grazing permit, copy of which shall be sent for record to the Divisional Officer, require that on a day fixed, not less than seven days from the date of the notice, he shall have all his cattle within his bathan to allow of their number being checked with his permit. Such inspections shall not be made oftener than four times in the year: they shall ordinarily be held between the hours of 7 and 10 A.M., so as not to cause unnecessary inconvenience to the permit-holder, who may, however, by giving at least two days' notice to the range officer,

fix any other hour between 8 A.M. and 6 P.M., of the day appointed by the notice that may be more convenient to himself. Should the permit-holder refuse or neglect to comply with the terms of the notice referred to above, or otherwise hinder the thorough inspection of his cattle, the issue to him of a fresh permit may be refused until he has complied with the requirements of this rule.

The Conservator may exempt by name, class, or locality any person or persons from the requirements of the preceding clause.

Nothing in this rule shall be held to debar any Forest or Police Officer from visiting and inspecting a bathan or cattle shed or pen within the reserved forests, or the cattle grazing in the forest.

14. Any Forest Officer attached to the Darjeeling Forest Division, to whom the range officer is subordinate, may exercise any of the powers conferred on a range officer by these rules.

The 12th October, 1885.—The services of *Mr. F. B. Manson*, Deputy Conservator of Forests, are placed at the disposal of the Government of India in the Home Department for one month, with effect from the 20th November, 1885.

During the absence, on deputation, of *Mr F. B. Manson, Mr. C. A. G. Lillingston*, Assistant Conservator of Forests, Palamow sub-division, will hold charge of the Chota Nagpore Forests Division and of the Hazaribagh sub-division of that division in addition to his other duties.

3.—NORTH-WESTERN PROVINCES AND OUDH GAZETTE—

No. $\frac{3694}{\text{II-448-7-13}}$.—*The 10th October, 1885.*—With effect from the 28th April, 1885, the date on which *Mr. C. J. Ponsonby*, was appointed to officiate as Conservator of Forests, 3rd grade—

Mr. W. G. Allan, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 2nd grade;

Mr. J. M. Braidwood, Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade;

Mr. E. F. Litchfield, Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 4th grade;

Mr. A. G. Hobart-Hampden, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator of Forests, 1st grade.

No. $\frac{3957}{\text{II-445-2-16}}$.—*The 27th October, 1885.—Mr. A. F. Broun*, Assistant Conservator of Forests, 1st grade, in charge of the Saháranpur Division of the School Circle, on being relieved by *Mr. M. H. Clifford*, to the charge of the Kheri Division of the Oudh Circle.

No. $\frac{3961}{\text{II-445-2-20}}$.—*The 27th October, 1885.—Mr. M. H. Clifford*, Officiating Assistant Conservator of Forests, 1st grade, at-

tached to the Dehra Dún Division, to the charge of the Sahá-ranpur Division, *vice Mr. A. F. Broun*, transferred to the Oudh Circle.

No. $\frac{4045}{\text{II-445-8-9}}$.—*The 3rd November, 1885.*—The services of *Mr. E. McA. Moir*, Deputy Conservator of Forests, 3rd grade, in charge of the Jaunsár Division, are placed temporarily at the disposal of the Government of India, Home Department, for employment in the Jeypore State.

No. $\frac{4048}{\text{II-445-8-12}}$.—*The 3rd November, 1885.*—*Mr. N. Hearle*, Officiating Deputy Conservator of Forests, 4th grade in charge of the local Working Plans Branch, to the charge of the Jaunsar Division of the School Circle, *vice Mr. E. McA. Moir*, deputed to the Jeypore State.

No. $\frac{5194}{\text{II-445-2-26}}$.—*The 13th November, 1885.*—In Notification No. $\frac{3957}{\text{II-445-2-16}}$, dated the 27th October, 1885, regarding the transfer of *Mr. A. F. Broun*, Assistant Conservator of Forests, omit "charge of the" after the words "to the."

4.—PUNJAB GAZETTE—

No. 455.—*The 22nd October, 1885.*—*Mr. E. S. Carr*, Assistant Conservator of Forests, Mooltan Division, returned to duty on the forenoon of the 10th October, 1885, from the three months' privilege leave of absence granted by *Punjab Government Gazette* Notification No. 827 S., dated 29th July, 1885.

No. 475.—*The 3rd November, 1885.*—*Mr. J. L. Pigot*, Assistant Conservator of Forests, returned to duty on the forenoon of the 22nd October, 1885, from the three months' examination leave granted by *Punjab Government Gazette* Notification No. 1362 S., dated 17th September, 1885.

No. 490.—*The 5th November, 1885.*—*Mr. A. M. Reuther*, Deputy Conservator of Forests, Lahore Division, returned to duty on the forenoon of the 27th October, 1885, from the three months' privilege leave granted to him by *Punjab Government Gazette* Notification No. 1186 S., dated 3rd September, 1885, relieving *Mr. A. L. McIntire* of the charge of that Division.

No. 500.—*The 11th November, 1885.*—Under the orders of the Government of India *Mr. J. Copeland*, Assistant Conservator of Forests, in charge of the Gujránwála Division, is deputed to the work of supervision of the survey of the Kalesar Forest in the Umballa Division, and of the course of practical surveying of students from the Forest School at Dehra Dún.

Mr. Copeland was relieved of the charge of the Gujránwála Division on the forenoon of the 26th October, 1885.

No 502.—*Mr. J. L. Pigot*, Assistant Conservator of Forests, is placed in charge of the Gujránwála Division, with effect from the forenoon of the 26th October, 1885, *vice Mr. Copeland* on deputation.

5.—CENTRAL PROVINCES GAZETTE—

No. 3891.—*The 7th October, 1885.*—*Mr. H. Moore*, Assistant Conservator of Forests, 1st grade, is promoted to officiate as Deputy Conservator of Forests, 4th grade, from 27th May, last, the date of his return to duty.

No. 3892.—*Messrs. M. S. Fowler* and *H. B. Anthony*, Assistant Conservators of Forests, 2nd grade, having passed the prescribed examinations, are promoted to officiate as Assistant Conservators of Forests, 1st grade, from 29th May last.

Mr. M. S. Fowler, Officiating Assistant Conservator of Forests, 1st grade, is promoted to officiate as Deputy Conservator of Forests, 4th grade, from 29th May last.

No. 3893.—*Mr. E. Dobbs*, Assistant Conservator of Forests, 1st grade, is appointed to officiate as Deputy Conservator of Forests, 4th grade, from 7th July last, the date of his assuming charge of the Seoni Division.

No. 4244.—*The 3rd November, 1885.*—The services of *Mr. G. F. Taylor*, Assistant Conservator of Forests, on return from furlough, are placed at the disposal of the Resident of Hyderabad for employment in the Berars.

No. 4280.—*The 4th November, 1885.*—*Mr. R. H. E. Thompson*, Deputy Conservator of Forests, is posted to the Chhattisgarh Division.

6.—BRITISH BURMAH GAZETTE—

No. 63.—*The 17th October, 1885.*—Under the provisions of section 18 of the Burma Forest Act, 1881, the forest situated at the sources of the Tavoy river, in the Tavoy district of the Tenasserim division, of which the limits are specified below, is declared to be a reserved forest from the 1st December, 1885. The reserve will be known as the *Kaleinaung Reserve.* Its approximate area is 460 square miles.

The privileges allowed within the limits of the reserve are shown in the statement hereto appended :—

BOUNDARIES.

North.—The watershed of the Yé and Tavoy rivers.

East.—The Siamese frontier from the source of the Kan stream to the Zinba stream.

West.—The western watershed of the Tavoy river as far south as the source of the Kalè stream.

South.—The Kalè stream to its mouth; thence the Tavoy river to its junction with the Zinba stream; thence the Zinba stream to the mouth of the Meinmapan stream; thence the Meinmapan West watershed and the watershed of the Yebôn and Kamaungthwè streams on the south, and Mèkè and Zinba streams on the north as far as the frontier.

Statement of Rights admitted and Privileges granted in the Kaleinaung Reserve, Tavoy District.

No.	Name and description of persons or property to whom or which right or privilege pertains.	Particulars of rights admitted and privileges granted.
1	The Migyaunghlaung villagers, ...	(*a*). The collection of forest produce for home consumption and the practice of taungya-cultivation, with the provision that none of the reserved trees, namely, thingan, magale, thitka, thitkado, anan, kanzo, karawe, and padauk be cut, mutilated, or destroyed, within the tract bounded as follows:— *North.*—The Balobalo stream. *East.*—The Thitka range. *South.*—The Zinba stream. *West.*—The Kaleinaung river. (*b*). Grazing rights over the whole of the above area. (*c*). The privilege of collecting canes (thunkyein) at and around Shweletkat-sakan for home use, but not for sale.
2	The Yabu and Kalè villagers, ...	(*a*). The collection of forest produce for home consumption and the practice of taungya-cultivation, with the provision that none of the reserved trees, namely, thingan, magale, thitka, thitkado, anan, kanzo, karawe, and padauk be cut, mutilated, or destroyed, within the tract bounded as follows:— *North.*—The Thatha stream.

		East.—The Kaleinaung river. *South.*—The Gyaing stream. *West.*—The west watershed of the Kaleinaung river. (*b*). Grazing rights over the whole area above mentioned at all times of the year. (*c*). The privilege of collecting the leaves of the wild toddy-palm (tawtan), thunpet, and tangopet for house-thatching in the reserve, on the western bank of the Kaleinaung river between the Kaleinbôk and Yenauk streams for home use, but not for sale.
3	Maung Yi,	To maintain and use their plantain gardens* situated near the Kyauktôn stream for five years on the following conditions:—
4	Maung Myat,	(*a*), that they shall not extend their gardens beyond their present limits or areas.
5	Maung Shwe Yo, ...	(*b*), that for the next five years no revenue shall be levied on their gardens.
6	Maung Chaung,	
7	Maung O, .	(*c*), that at the end of five years they shall give up their gardens to Government and remove outside the reserve.

	Acres.	A.	P.
Maung Yi's gardens, ...	56	13	0
Maung Myat's garden, ...	30	15	10
Maung Shwe Yo's garden, ...	18	6	1
Maung Chaung's gardens, ...	15	7	0
Maung O's garden, ...	4	3	5

Statement of Rights admitted and Privileges granted in the Kaleinaung Reserve Tavoy District—(concluded).

No.	Name and description of persons or property to whom or which right or privilege pertains.	Particulars of rights admitted and privileges granted.
8	The public in general,...	Right-of-way along the following paths :— 1.—The path which goes from Migyaunghlaung village to Yabu village. 2.—The path which goes from Migyaunghlaung village to Shintabi village. 3.—The path which goes from Migyaunghlaung village to Zinba village. 4.—The path which goes from Migyaunghlaung village to the Siamese frontier *viâ* Natkyizin, Kadunsakan, and Ethè stream. 5.—The privilege of cutting bamboos, timber of unreserved kinds of less than three feet in girth, and firewood for use *en route* within 100 feet on each side of the above roads, as also grazing rights within one mile of such places as may be duly notified as public camping-grounds.

No. 64.—*The 19th October, 1885.*—Under the provisions of section 21 of the Burma Forest Act, 1881, the following revised statement of privileges granted in the Gônnwè forest reserve is published in supersession of the statement published under this Department Notification No. 70 (Forests), dated the 18th December, 1884 :—

Statement of Rights admitted and Privileges granted in the Gônnwè Reserve, Toungoo District.

No.	Name and description of persons or property to whom or which right or privilege pertains.	Particulars of rights admitted and privileges granted.
1	The Thaukyegatwa village, ...	The inhabitants of all these villages are permitted to cut bamboos for their own domestic use only within the reserve between the 1st March and 30th June yearly. The inhabitants of the villages of Shangyi, Sinmido, and Tabyi are permitted to graze their cattle in the southern portion of the reserve during the months of July, August, September, October, November, December, and January only.
2	The Pèbôk village, ...	
3	The Yegyaw village, ...	
4	The Seikkyi village, ...	
5	The Tantabin village, ...	
6	The Tabyi village, ...	
7	The Shangyi village, ...	
8	The Sinmido village, ...	
9	The Thèmè village, ...	
10	Kyauk-o village, ...	
11	The public in general, ...	A right-of-way to the public is allowed along the road leading from Thayeba to Sinmido.

7.—ASSAM GAZETTE—

No. 343.—*The 22nd October, 1885.—Mr. D. P. Copeland,* Assistant Conservator of Forests, made over charge of the Goálpára Forest Division to *Colonel T. B. Michell,* Deputy Commissioner of Goálpára, on the afternoon of the 15th October, and availed himself of privilege leave from the forenoon of the following day.

No. 346.—*The 29th October, 1885.—Mr. J. T. Jellicoe,* Deputy Conservator of Forests, returned from privilege leave, and took over charge of the Darrang and Nowgong Forest Division from *Babu Jogesvar Sur,* Sub-Assistant Conservator of Forests, on the forenoon of the 26th instant.

Babu Jogesvar Sur, Sub-Assistant Conservator of Forests, is attached since that date to the Darrang and Nowgong Division, on special duty until further orders.

No. 31.—*The 5th November, 1885.*—The Officiating Chief Commissioner is pleased to sanction the formation of the forests in the district of Nowgong into a separate forest division with effect from the 1st January, 1886.

Babu Jogesvar Sur, Sub-Assistant Conservator is placed in charge of the Nowgong Forest Division.

8.—MYSORE GAZETTE—

Nil.

9.—MADRAS GAZETTE—

No. 281.—*The 21st September, 1885.*—His Excellency the Governor in Council is pleased to declare, under the provisions of section 16 of the Madras Forest Act (Act V. of 1882), that, from the 1st November, 1885, the areas, the boundaries of which are set forth in the schedule appended to this notification, shall be constituted "Reserved Forests" under the said Act.

SCHEDULE.

No.	District.	Sub-division and Village.	Name of Forest.	Boundaries.	Remarks.
1	Nilgiris, ...	Ootacamund Settlement,	Woodcock Shola No. I.,	*North.*—D-133. *East.*—D-128. *South.*—D-127 and F-220. *West.*—Dodabetta road, north.	
2	Do., ...	Do., ...	Woodcock Shola No. II.,	*North.*—D-132. *East.*—D-132, D-130, D-104. *South.*—D-127. *West.*—D-128 and D-133.	The following rights of Messrs. Ebram Sillaman and Co., Ootacamund, have been admitted:— (*a*), A right of user of water flowing from the Shola stream to survey No. D-132. (*b*), A right-of-way through the reserve from survey No. 131-D to survey No. 133-D.
3	Do., ...	Do., ...	Woodcock Shola No. III.,	*North.*—D-127. *South.*—D-124. *East.*—D-126. *West.*—Kótagiri road.	The following public rights-of-way have been admitted in this reserve:— (*a*), The Kótagiri road.

No.	District.	Sub-division and Village.	Name of Forest.	Boundaries.	Remarks.
					(*b*), The foot-path leading to the Badaga villages.
4	Nilgiris, ...	Ootacamund Settlement,	Dodabalta No. I., ...	*North.*—D-104. *East.*—D-117, D-116 and F-225. *South.*—F-228. *West.*—D-120 and D-118.	The following public rights-of-way have been admitted in this reserve:— (*a*), The bridle-path to Kótagiri generally known as the "Kótagiri road." (*b*), The two foot-paths leading to the Dimmanhatti village.
5	Do., ...	Do., ...	Dodabalta No. II., ...	*North.*—D-104 and D-105. *East.*—A line from the western point of D-106 to the north-east corner of D-116. *South.*—D-116. *West.*—D-116 and D-117.	The following public rights-of-way have been admitted in this reserve:— (*a*), The two foot-paths leading to the Kemthachappai and Dimmanhatti villages.
6	Do., ...	Do., ...	Mainalai Reserve, ...	*North.*—The Kótagiri road, south from the north-east corner of F-246 to the second bend in the road near the lower shola.	The following public right-of-way have been admitted in this reserve:—

				East.—Thence a line across a shola and on to the corner of F-273, then F-273, and a path striking the lower end of two sholas to F-270. *South.*—F-270, and a line across the eastern corner of F-258, then to the north and west sides of F-258, then along the top of the main ridge over Allamby's butts. *West.*—F-246.	(*a*), The foot-path from the Kótagiri road to the Kaiti village.
7	Do., ...	Do., ...	Dodabetta Reserve No. I., *addition to,...*	*North.*—A line from the east corner of D-267 across Government waste to the reserve, then the reserve boundary. *East.*—The reserve. *South.*—From the north corner of F-217 along the ridge and across the valley through the junction of the roads from old Ootacamund and Wood end to Dodabetta to the south-east corner of D-268. *West.*—D-268, D-272, and D-267.	The following public rights-of-way has been admitted in this reserve:— (*a*), The Dodabetta road. (*b*), Two plots of land forming part of F-219-C, measuring ½ and ¾ acres respectively, though included within the specified boundaries of this reserve, have been excluded from reservation, and have been granted to the Ootacamund Municipality on the follow-

No.	District.	Sub-division and Village.	Name of Forest.	Boundaries.	Remarks.
					ing conditions:—(1), that they are used for the purpose of a burial ground by the Hindu inhabitants of "Old Ooty" and for no other purpose without the consent of Government; and (2), that they are liable to be closed and resumed by Government whenever they deem fit.
8	Nilgiris, ...	Ootacamund Settlement,	Nergodumund,	*East and North.*—From the north-west corner of A-107 by a road and then a stream as far as the north-east corner of A-65, then A-65, west, A-65 and A-67. *South.*—From the east corner of A-67 along a ridge and down skirting the shola to the point where the north boundary began.	
9	Do., ...	Do., ...	Fairlawns Block No. II.,	A shola forming the lower part of I-63 and touching the Avalanche path on the east. On all other sides Government waste.	

10	Do., ...	Do., ...	Madana, ...	*North.*—The north boundary of I-63 and across to the south-west corner of I-65, then I-65 to the south-west corner of I-68. *East.*—Thence to the top of the hill. *South.*—A line across the valley to a road trace, then along it and skirting the shola to the path to Morgan's shola. *West.*—That path.	The following public right-of-way has been admitted in this reserve :— The bridle-path from Governor's shola road to the Avalanche road.
11	Do., ...	Do., ...	Baikie Reserve, *addition to*,...	*North and East.*—I-5 and across I-6 and round the edge of it to the Governor's Shola road. *South.*—Governor's shola road. *West.*—The Settlement boundary.	

No. 282.—His Excellency the Governor in Council is pleased to declare, under the provisions of section 16 of the Madras Forest Act (Act V. of 1882), that, from 1st November, 1885, the area, the boundaries of which are set forth in the schedule appended to this notification, shall be constituted a "Reserved Forest" under the said Act:—

SCHEDULE.

District.	Sub-division.	Name of Forest.	Boundaries.	Remarks.
Nilgiris, ...	Ootacamund Settlement,	Fairlawns Block, No. I., ...	*North-east.*—A line part of I-76 from the Avalanche bridle-path to the Mailkonda new road. *East.*—The Mailkonda new road to the bridge, then a stream skirting I-123, I-122, I-124, I-125 and across the H-15 to the road trace. *South.*—The south boundary of H-15 and across the H-10, then H-10 and H-9 to the Avalanche bridle-path. *West.*—That path, then past I-130 round a shola to the path again, then the path to the north boundary.	The following public rights-of-way have been admitted through this reserve:— (*a*), The Avalanche road. (*b*), The Mailkonda road.

No. 294.—*The 27th October, 1885.—Mr. J. S. Gamble,* Conservator of Forests, Northern Division, privilege leave for three months, from or after 1st December next, under section 74 of the Civil Leave Code, 6th edition.

No. 297.—*The 23rd October, 1885.—Mr. A. W. Peet,* Deputy Conservator of Forests, 2nd grade, and District Forest Officer, Coimbatore (North), is placed on special duty in connection with the settlement of the Travancore-Coimbatore boundary and the arrangement and despatch of the forest collections of economic products for the London Exhibition, 1886.

No. 298.—*Mr. W. C. Hayne,* Deputy Conservator of Forests, 3rd grade, to act as District Forest Officer, Coimbatore (North), during the absence of *Mr. Peet,* on special duty, or until further orders.

No. 299.—*Mr. C. E. Brasier,* Assistant Conservator of Forests, 2nd grade, to be District Forest Officer, Tinnevelly.

10.—BOMBAY GAZETTE—

The 29th October, 1885.—Mr. T. R. D. Bell, Divisional Forest Officer, Central Division of Kánara, resumed charge of his office from *Mr. B. J. Haselden,* Sub-Assistant Conservator of Forests, in charge Kánara Saw Mills, on the 24th October, 1885, before office hours.

No. 8821.—*The 31st October, 1885.*—The privilege leave for three months granted under Government Notification No. 8446, dated the 16th instant, to *Mr. W. H. A. Wallinger,* Deputy Conservator of Forests, 1st grade, is commuted retrospectively into furlough on medical certificate for one year.

2. His Excellency the Governor in Council is pleased to appoint *Mr. R. C. Wroughton,* to do duty as Deputy Conservator of Forests, Poona, during the absence of *Mr. Wallinger,* or till further orders.

No. 8897.—*2nd November, 1885.*—With reference to Government Notification No. 1295 of 11th March, 1879, published at pages 297—304 of the *Bombay Government Gazette* of the 13th idem, Part I., His Excellency the Governor in Council is pleased to direct that a portion of Survey No. 501 of Dusána in the Pimpalner Táluka of the Khándesh District comprising the lands specified in the schedule hereto annexed shall cease from the date of this notification to be Protected Forest:—

Schedule referred to above.

Name of Village.	Survey No. to be excluded.	Area to be excluded.	
		A.	G.
Dusána, ...	502	22	7
	503	13	37
	509	4	6
	...	1	31
	...	1	2
Total, ...		43	3

No. 8897*A.*—It is hereby notified for public information that the land mentioned in the second column in the schedule hereto annexed, which was notified on 11th March, 1879, under Government Notification No. 1295, under Section 28 of the Indian Forest Act, No. VII. of 1878, as Protected Forest in the Pimpalner Táluka of the Khándesh District, and is to be retained as Protected Forest, after the deductions made by Government Notification No. 8897 of to-day's date, is comprised in the revised survey numbers specified in the third column of the schedule:—

Schedule referred to above.

Name of Village.	Old Survey Number.	Revised Survey Numbers.
Dusána, ...	...	501
	...	504
	501	505
	...	506
	...	507
	...	508

No. 8898.—In exercise of the power conferred by Section 19 of the Indian Forest Act, No. VII. of 1878, His Excellency the Governor in Council is pleased, with reference to Government Notification No. 2675, dated 30th March, 1885, published at page 459 of the *Bombay Government Gazette* of 2nd April, 1885, Part I., to declare the lands specified in the schedule hereto annexed Reserved Forests in the Nándgaon Táluka of the Násik District from 15th December, 1885:—

Schedule referred to above.

Name of Village.	Survey No.	Area.	
		A.	G.
Malgaon, ...	49	16	8
Birole, ...	26	17	9
Total, ...	...	33	17

No. 8924.—*The 3rd November, 1885.*—Under the provisions of Section 5 of the Indian Registration Act III. of 1877, His

Excellency the Governor in Council is pleased to direct that on and from the 1st day of April, 1886, the town of Mahudha and the villages noted in the margin* shall be transferred from the sub-district of Nadiád in the district of Kaira and shall form a new sub-district to be called the sub-district of Mahudha.

* Bháner, Dhandhodi, Vadtál, Finův, Bhimas, Hajátin, Singoli, Faloli, Ghogháwára, Wásna, Ninávára, Mehmadabad-Muvádi, Khurdávad, Balol, Rupera, Dadusar, Khadolvádi, Khadol-náni, Tornia and Nandgám.

No. 8938.—In exercise of the power conferred by Section 19 of the Indian Forest Act, No. VII. of 1878, His Excellency the Governor in Council is pleased, with reference to Government Notification No. 1982, dated 9th March, 1885, published at page 304 of the *Bombay Government Gazette* of 12th idem, Part I., to declare the lands specified in the schedule hereto annexed Reserved Forests in the Sinnar Táluka of the Násik District from 1st December, 1885 :—

Schedule referred to above.

Name of Village.	Survey Nos.	Area.	
		A.	G.
Thángaon, ...	55	14	36
Anwdhewádi, ...	130	12	13
	131	23	27
Khaprállé, ...	57	0	18
	58	53	0
Mohodari, ...	7 (2)	2	2
	11 (2)	2	32
Deswandi, ...	193	5	21
Chincholi, ...	72	12	27
Belu, ...	115	11	36
	110	73	28

The 4th November, 1885.—Mr. R. C. Wroughton, Deputy Conservator of Forests, delivered over and *Mr. S. Hornidge*, A.M.I.C.E., received charge of the Divisional Forest office, South Thána, on the 26th October, 1885, after office hours.

Mr. W. R. Gaunde, Sub-Assistant Conservator of Forests, delivered over and *Mr. R. C. Wroughton*, Deputy Conservator of Forests, received charge of the office of the Divisional Forest office, Poona, on the 27th October, 1885, after office hours.

The 13th November, 1885.—Mr. G. A. Hight, Deputy Conservator of Forests and Divisional Forest Officer, Bijápur, delivered over charge to *Mr. Gopal Swamirao*, Range Forest Officer, Bágalkot, on the 26th October, 1885, after office hours.

Mr. J. M. Fernandez, Sub-Assistant Conservator of Forests, received charge of the Divisional Forest office, Bijapur, from *Mr. Gopal Swamirao*, Range Forest Officer, Bagalkot, on the 28th October, 1885, after office hours.

The 15th November, 1885.—Mr. J. L. L. MacGregor, Deputy Conservator of Forests, and Divisional Forest Officer, Belgaum, delivered over charge to *Mr. H. Woodward*, 1st Assistant Collector, Belgaum, on the 29th October, 1885, after office hours.

Mr. J. L. L. MacGregor, Deputy Conservator of Forests, resumed charge of the Divisional Forest office, Belgaum, from *Mr. H. Woodward*, 1st Assistant Collector, Belgaum, on the 5th November, 1885, during office hours.

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